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YEARBOOK

OF THE

~~UNITED STATES~~ DEPARTMENT OF AGRICULTURE

1913

WASHINGTON
GOVERNMENT PRINTING OFFICE
1914

[CHAPTER 23, STAT. L., 1895.]

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[AN ACT Providing for the public printing and binding and the distribution of public documents.]

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Section 73, paragraph 2:

The Annual Report of the Secretary of Agriculture shall hereafter be submitted and printed in two parts, as follows: Part One, which shall contain purely business and executive matter which it is necessary for the Secretary to submit to the President and Congress; Part Two, which shall contain such reports from the different Bureaus and Divisions, and such papers prepared by their special agents, accompanied by suitable illustrations, as shall, in the opinion of the Secretary, be specially suited to interest and instruct the farmers of the country, and to include a general report of the operations of the Department for their information. There shall be printed of Part One, one thousand copies for the Senate, two thousand copies for the House, and three thousand copies for the Department of Agriculture; and of Part Two, one hundred and ten thousand copies for the use of the Senate, three hundred and sixty thousand copies for the use of the House of Representatives, and thirty thousand copies for the use of the Department of Agriculture, the illustrations for the same to be executed under the supervision of the Public Printer, in accordance with directions of the Joint Committee on Printing, said illustrations to be subject to the approval of the Secretary of Agriculture; and the title of each of the said parts shall be such as to show that such part is complete in itself.

ORGANIZATION OF U. S. DEPARTMENT OF AGRICULTURE.

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Insecticide and Fungicide Board, J. K. HAYWOOD, *Chairman.*
Federal Horticultural Board, C. L. MARLATT, *Chairman.*
Office of Markets, CHARLES J. BRAND, *Chief.*

CONTENTS.

ILLUSTRATIONS.

PLATES.

TEXT FIGURES.

YEARBOOK OF THE U.S. DEPARTMENT OF AGRICULTURE

REPORT OF THE SECRETARY.

MR. PRESIDENT: I respectfully present my report for the Department of Agriculture for the year 1913. I shall deal as briefly as possible with the business of the department, point out the changes in organization that have been made, summarize the more important results and developments, and indicate the recommendations submitted to Congress for action.

Those interested in the details of the work of the several bureaus and divisions will find in the reports from the several officers full and detailed information.

BUSINESS OPERATIONS.

The scope of the activities of the department is constantly increasing. When the department was first organized and for a number of years thereafter its work was confined largely to matters directly affecting agriculture. Later, the Weather Bureau and the Forest Service were transferred to the department, and more recent legislation has charged the department with the enforcement of numerous regulatory laws, including those relating to meat inspection, animal and plant quarantine, foods and drugs, game and migratory birds, seed adulteration, insecticides and fungicides, the manufacture of vaccines and viruses, etc., many of which have only an indirect bearing on agriculture. Its activities now affect not only those living in rural communities but urban dwellers as well; so it can be said that the work of the department at the present time concerns directly or indirectly all the people.

APPROPRIATIONS.

To carry on the work of the Department of Agriculture during the fiscal year ended June 30, 1913, Congress appropriated $16,651,496 for ordinary expenses, in addition to

which permanent annual appropriations, special appropriations, and balances from prior years amounting to $8,303,412.68 were available, making a total of $24,954,908.68. The total funds which have been or will be returned to the Treasury as unexpended balances of appropriations and miscellaneous receipts aggregate $3,132,303.82. Of this amount, there was received during the fiscal year ended June 30 last, from the sale of timber, for grazing, condemned property, etc., $2,449,287.66, which has been deposited in the Treasury as miscellaneous receipts and can not be used unless reappropriated by Congress.

COMPARISON OF EXPENDITURES FOR VARIOUS LINES OF WORK.

The present appropriations for work of a regulatory nature or only indirectly affecting agriculture constitute about three-fifths of the total funds of the department, or approximately $15,000,000, leaving two-fifths, or $9,000,000, available for scientific research, experiments, and demonstration work directly affecting the farmer. While it would be difficult to segregate the funds which are used for purely demonstration work, because of its close relation in many instances to investigational work, it is safe to say that more than $1,000,000 is devoted to such work.

APPROPRIATIONS RECOMMENDED.

In the estimates for the next fiscal year I have recommended an increase in the appropriations for the department of $1,074,387. The principal items in this increase are:

For extending the work of eradicating animal diseases, the enlargement of the work in feeding and breeding live stock, for dairying, and for enlarging and enforcing the meat-inspection law, $250,860.

For the extension of investigations in connection with the introduction and breeding of new plants, the study and control of plant diseases, and the improvement of crop production with particular reference to cereals, $45,660.

For the classification of agricultural lands and the survey of forest homesteads on the national forests, $143,577.

For extending the investigations of the handling, shipping, and storing of poultry, eggs, and fish, which are carried on in

connection with the enforcement of the food and drugs act, $60,441.

For enlarging the investigation of fertilizer resources, soil-fertility investigations, and investigations of the chemical and physical properties of soils, $24,420.

For extending investigations in connection with insects attacking deciduous fruits, cereals, forage crops, and forest trees, $71,000.

For the enforcement of the migratory bird law, $90,000.

For increasing the accuracy of crop forecasts and estimates, $57,000.

For extending the study of road management and investigations of road construction and maintenance, $113,550.

For investigations of the marketing and distribution of farm products, $144,000.

For the inauguration of live-stock and crop demonstrations in the sugar-cane and cotton areas of Louisiana, $50,000.

A recommendation has been made for the discontinuance of the present method of congressional seed distribution and the substitution of constructive work in the securing and distributing of new and valuable seeds and plants. This work can be done at a decreased cost of $146,000.

By reorganizations in the work of the Weather Bureau a saving of $37,340 can be effected, and yet the efficiency of the work can be increased. A decrease of the amount indicated has been recommended accordingly.

IMPROVED ACCOUNTING SYSTEM.

An important change in the system of handling the fiscal affairs and methods of accounting in the department was effected toward the close of the year. The change so far is proving very satisfactory, and is resulting in great economy in time and money.

A further change has been made. The administrative audit of accounts, formerly made in the Division of Accounts and Disbursements, has been transferred to the several bureaus. This change was made necessary by a provision in the act of August 23, 1912 (37 Stat., p. 375). The head of each bureau is now held responsible for the accuracy of accounts arising in his bureau.

Under the revised system of accounting the classification of expenditures according to their character, which was one of the features of the system inaugurated by the Commission on Economy and Efficiency, has been retained, but in a simplified form. The budget plan recommended by the commission is used to a considerable extent in preparing the annual estimates. The various supervising officers estimate the amounts which will be needed for the various items of expenditure, including salaries, travel, station and field expenses, equipment, apparatus, stationery, furniture, rent, freight, fuel, etc., and from these estimates the total funds which will be required for each line of work or activity are computed.

PERSONNEL.

The securing of men of the requisite training and experience in the various fields of agricultural science has been one of the serious problems which for some time has confronted the department. Two causes have tended to bring about this situation. One has been the low maximum salary which the department is permitted to pay to its scientific investigators as compared with the salaries paid by outside institutions and commercial concerns. The other has been the comparatively small number of strong, virile men who have been trained in scientific agriculture. Because of the great demand for such men in this country and abroad, the department is constantly losing men whom it ought to keep, and it is unable to find an adequate supply of just the right type of man to replace them. With the growing demands for men trained in the newer fields of rural economics, rural sanitation, marketing, cooperation, and similar subjects, the situation is becoming acute.

Under the present law the maximum salary which can be paid is $4,000. Many of the leaders in the department are men who could command salaries in many cases more than twice what they are receiving, but who remain because of their interest in the work. It is only fair to such men that the department should be in a position to recognize their services to the country in a substantial way.

The department has consistently maintained that its scientific work would be seriously handicapped by the creation of fixed or statutory positions for its scientific investi-

gators, and that a system of fixed salaries would cause it to lose many men because of the great demand for their services on the outside. Authority is now vested in the Secretary to make promotions of employees engaged in scientific and technical work from time to time. Great care has been exercised to prevent abuse of this authority, and the plan has proved extremely satisfactory as well as economical. Practically all of the clerical and subclerical employees of the department are on the statutory roll, and no particular difficulty has been experienced under the system of fixed salaries.

CHANGES IN PERSONNEL.

There were 14,478 employees in the department on July 1, 1913. Of these, 2,924 were employed in Washington and 11,554 outside of Washington. Of the entire force, 1,812 were engaged in scientific investigations and research, 1,323 in demonstration and extension work, 687 in administrative and supervisory work, 6,021 in regulatory and related work, and 4,635 were clerks and employees below the grade of clerk. One thousand one hundred and thirty-four probational appointments in the classified service (positions subject to examination), 153 reinstatements, and 83 transfers from other departments were made during the past year. There were 2,699 promotions and 113 reductions in salaries. The resignations totaled 885; 227 appointments were terminated; 38 persons were removed from the service on account of misconduct; and there were 52 deaths. In the positions excepted from examination, chiefly agents and experts, there were 2,919 appointments made for temporary periods, 145 promotions in salary, and 115 reductions. Four hundred and twenty-four of these employees were separated from the service through removal, resignation, or death, and 1,925 appointments terminated.

EFFICIENCY RATINGS.

The need in the department of a uniform system of efficiency ratings and registers for clerical and subclerical employees on the statutory roll on which to base promotions has been felt for a long time. After conference with the civil-service officials, such a system was inaugurated early in the summer. It is believed that this system will eliminate

to a large extent the danger of making favoritism or any other consideration rather than merit the reason for promotion.

The department is working in the closest possible relationship with the Civil Service Commission in the handling of its appointments. Because of the technical and scientific nature of much of the work of the department, it has been found difficult to secure the right kind of men from the regular registers of the commission. It has therefore been necessary to hold special examinations from time to time.

CHANGES IN ORGANIZATION OF THE DEPARTMENT.

The foregoing changes were made to promote economy, the orderly handling of financial matters, and the development of individual efficiency in the business force. Other changes in organization have been effected which aim to develop better coordination among the several bureaus of the department and between the department and other Federal departments and the State agricultural agencies.

REORGANIZATION OF THE WEATHER BUREAU.

Following the report of a special committee charged with suggestions for the reorganization of the Weather Bureau, changes have been brought about which reduce expense, eliminate certain duplications between Federal departments, and restore that bureau strictly to its field of scientific usefulness, from which at one time it had somewhat departed. Under this reorganization it will conduct its work wholly in the interests of agriculture, commerce, and navigation, and will plan its research work with a view to improving its services to these three important interests.

THE STATIONS AND SUBSTATIONS.

One of the first steps will be the gradual reorganization of the stations and substations. This will include the elimination of stations and substations which are not needed, the limiting to forecasting of the work of stations which are not well located for carrying on climatological work previously assigned to them, the discontinuance of the issuance of complete maps from stations in territories where these maps have not proved of interest or particular value, and the confining of the work of certain stations to special crop

service. In this plan certain river, rainfall, and snowfall stations will be discontinued and changes will be made in the location of other stations to effect telegraphic, cable, and telephonic economies.

COOPERATION WITH THE HYDROGRAPHIC OFFICE.

Cooperation between the Hydrographic Office of the Navy Department and the Weather Bureau in the matter of the publication of marine meteorological charts has been effected. The Weather Bureau will discontinue the publication of marine meteorological charts and will hereafter supply to the Hydrographic Office for publication on the pilot charts all necessary meteorological data, and the Hydrographic Office will reciprocate by supplying these charts to all Weather Bureau stations requiring them.

CHANGE OF PLAN AT MOUNT WEATHER.

One of the most important recommendations is that the extensive work in meteorology, observation of terrestrial magnetism, study of solar and astrophysical problems, and aerial observations, hitherto carried on at Mount Weather, near Bluemont, Va., be discontinued, and that it be made a simple meteorological station for the taking of climatological records. The committee, in a complete report on the subject, found that the property at Mount Weather was purchased prior to 1903 and building operations begun early in the summer of that year. A committee of scientists from the bureau reported against the use of this property for aerial research in 1903, and within the past year other committees reported that solar radiation, upper-air research, and dynamic meteorology could better be carried on at other locations. For this reason the department has determined to discontinue the research work at this observatory and operate it simply for the taking of climatological records. This can be done by the man who will protect the property, at a total cost of about $1,000 per year. This will make available approximately $12,600, which can be expended to far greater advantage for scientific research.

LINES OF WORK.

The work of the Weather Bureau will be strengthened by increased attention to the matter of special crop warnings, designed to give growers of special crops an opportunity to

take protective measures. This is particularly important for the southern fruit crops, which are subject to damage by unexpected frosts. The bureau will also develop its work of giving flood warnings to districts along waterways which are subject to sudden rises.

The forecasting and warnings service will be improved by the assignment of assistant forecasters to certain centers so that the evening forecasts for these districts can be made at the center.

The scientific work will include special attention to studies of storm, hurricane, frost, and cold waves, normal monthly storm tracts, the magnetics and thermodynamics of the atmosphere, solar radiation, quantity and quality of daylight, light intensity and sun and shade temperatures, temperature in relation to plant growth, evaporation, water requirements of crops, precipitation and snowfall, rivers and floods, and motions of the lower atmosphere—a study which is of growing importance, especially to aviators and engineers.

REORGANIZATION OF THE BUREAU OF STATISTICS (AGRICULTURAL FORECASTS).

It is proposed that the name of the Bureau of Statistics be changed to "Bureau of Agricultural Forecasts," as indicating more clearly the nature of its work. The figures compiled and published by the bureau are simply estimates or forecasts of crop prospects or production based upon the most careful use of all information attainable from thoroughly reliable sources. Much of the work of a purely statistical nature hitherto carried on by this bureau has now been assigned to other branches of the department or to other Federal departments to which it more properly belongs.

COOPERATION WITH POST OFFICE DEPARTMENT.

In the preparation of forecasts of production the department has entered into a cooperative arrangement with the Post Office Department which it is believed will make the figures of the estimates and forecasts still more reliable. Through this arrangement it is hoped that a system can be effectively inaugurated whereby the rural postmasters and rural route mail carriers will assist in collecting actual figures of total acreage and also gather complete figures of live stock.

FIELD FORECAST AGENTS AND CROP SPECIALISTS.

With a view to increasing the accuracy of its forecasts the bureau proposes to employ a number of specially qualified field forecast agents and crop specialists, to be obtained through rigid civil-service examination. The field forecast agents will be assigned to States in which agricultural production is not large and will spend their entire time in investigation of actual crop conditions within their territories. Crop specialists who have hitherto been used in gathering information on special crops, such as tobacco and cotton, will be employed to gather similar data on other important agricultural products. The system of collecting information through county, township, and individual voluntary correspondents will be retained, improved, and strengthened.

SIMULTANEOUS PUBLICATION OF FORECASTS.

It was found upon investigation that details of individual State forecasts must be in the hands of the farmer with the least possible delay if he is to gain from them any advantage in the marketing of his own products. By simple and effective cooperation with the Weather Bureau this result has been achieved effectively and at a purely nominal cost. Under this plan the important details of forecasts for each State are telegraphed to the central weather station in that State. The weather station immediately prints copies of these figures, which show the forecast for that State compared with 10-year averages. The information is mailed without delay to all newspapers and agricultural and commercial publications within that State and reaches them within 24 hours, thus quickly reaching the actual producer. By this method the farmers in States distant from Washington get the State forecast, which, it has been found, is an even more important factor in the disposal of their products than the forecast of total production in the country, without the long delay which would follow if these State forecasts were mailed from Washington.

COMMITTEE OF COOPERATION.

In order to coordinate certain phases of the work of the Bureau of Agricultural Forecasts with other branches of the department, and also to prevent duplication of work and

lack of harmony in statistical matters between the department and other Federal departments, a committee of cooperation has been established.

COOPERATION IN SOIL-SURVEY WORK.

With the view of making soil surveys more valuable to the farmer, a new basis of cooperation has been established with the States through their experiment stations, agricultural colleges, and agricultural bureaus. Under this plan the department will give precedence in conducting detailed soil surveys to those States which cooperate with the department in the matter and which request that such surveys be made. During the past year 19 States have appropriated money for soil surveys in cooperation with the department. If the request for soil surveys on the part of cooperating States absorbs all the department's funds for such work, no projects will be undertaken in noncooperating States. It is believed that where the soil surveys are made at the special request of the State agricultural agency and in districts where the State is actively engaged in extension work, the State authorities will be willing and able to help the farmer to gain the greatest possible benefit from the department's reports and soil-survey maps.

A second phase of cooperation in soil-survey matters has been the work of the department in limiting its so-called reconnoissance surveys largely to land classification of the national forests and to undeveloped areas of the country where detailed information is not immediately needed; work has been done in 10 States covering 30 projects.

COOPERATION IN LEGAL WORK.

Through cooperation with the Department of Justice arrangements have been effected during the year by the Solicitor for the more expeditious and economical handling of criminal cases and highly technical cases under the food and drugs act and the insecticide act. Hereafter the Solicitor will report criminal cases to the Department of Justice in the form of criminal informations, which, if approved by the United States attorneys, may be immediately filed. This will economize the time of the Department of Justice and expedite action in the courts. A similar system for handling

all cases under the penal statutes committed to this department for administration will be recommended.

In the trial of the cases under these acts the points of issue frequently call for a complete understanding on the part of the legal representative of the Government of highly technical questions of chemistry and food or drug technology. The department, therefore, has made arrangements whereby in cases involving intricate technical questions the Solicitor and his assistants will assist the United States attorneys in the actual trials. In this way there will be placed at the disposal of the Department of Justice the more intimate knowledge which necessarily must be obtained by the Solicitor in preparation of the case than can be acquired by the United States attorneys through correspondence or in the restricted time at their command.

There is now under consideration a scheme of cooperation between the Department of the Interior and this department with respect to the handling of litigation involving claims to lands within the national forests, with a view to determining whether, and if so, to what extent, there may be duplication of work. The ultimate purpose is to recommend such change in the procedure as may be necessary to eliminate such duplication.

CHANGES AFFECTING THE ENFORCEMENT OF THE FOOD AND DRUGS ACT.

MEATS AND MEAT FOOD PRODUCTS.

The decision of the Attorney General, and subsequent action by the Secretaries of the Treasury, Agriculture, and Commerce, in rescinding regulation No. 39 placed meats and meat food products under the provisions of the food and drugs act as well as under the meat-inspection law. Prior to that time meats and meat food products had been exempt from the operation of the so-called pure-food law. Placing all these products under the provisions of this act called for the establishment of new machinery and certain reorganizations in the Bureau of Chemistry, and made necessary close cooperation between that bureau and the Bureau of Animal Industry. The general effect of the change was to give the Federal Government control over meat and meat food products in interstate commerce in all stages of their transit,

instead of largely limiting their control to these products while they were actually within the jurisdiction of a federally inspected meat establishment.

COOPERATION WITH THE STATES.

It has long been recognized that inconsistencies between the food and drugs act and the food, drug, and dairy laws of the different States, as well as lack of uniformity in State legislation, have greatly hindered the prevention of fraud, adulteration, and misbranding in food and drugs and have made it difficult to induce manufacturers to improve their products. It is wasteful for the Federal food and drug authorities and the State authorities to work at cross purposes, and the department is making every endeavor to bring about effective cooperation. To this end, the Secretary invited all the State food and drug officials to attend a conference with representatives of the department to determine ways and means of bringing about better coordination of functions and closer cooperation. This conference was held on November 13 and 14 and attended by 23 food commissioners and 26 other State officials, representing 33 States, including Porto Rico and the District of Columbia. It was unanimously agreed by those attending the conference that effective cooperation was desirable, and agreements were reached as to specific measures which would aid in bringing this about. The conference made clear the necessity of establishing within the department an organization to be charged with the dissemination of information concerning the sanitary conditions of food production, violations of the law, new forms of sophistication, and new methods for their detection. The establishment of such an organization it is expected will do much to prevent duplication of research and investigation and make food and drug control far more effective. It is hoped also that with increased cooperation will come effective control through State agencies of conditions under which food factories manufacture their products, and better control of such foods as milk, eggs, oysters, and fish, which can be contaminated with micro-organisms and may communicate disease. Under the conditions of the Federal law the department can exercise no policing control over the actual factories and dairies, and detection of con-

tamination resulting from unclean or undesirable conditions is most difficult in the finished product. Many of the measures recommended at the conference call for changes in existing Federal statutes, and the State officials have appointed a number of committees to prepare reports and practical suggestions as to measures that will tend to unify State and Federal work in this field.

COORDINATION IN INSPECTION WORK.

The effective administration of the food and drugs act has been hindered to some extent by the fact that the food and drugs laboratories and the food and drugs inspectors were acting independently of each other in the same territory. With two sets of absolutely independent officials in the same territory, each reporting directly to Washington, there could be little coordination. To avoid this, the United States will be divided into a few general inspection districts, each in charge of a competent official, and all laboratories and inspectors working in that territory will be under the same immediate direction. Certain of the smaller branch laboratories outside of Washington will be closed, because the same work can be done more economically and effectively in the larger laboratories, which have specializing chemists and a more complete scientific equipment. The food and drugs inspectors similarly will be grouped in the larger centers and will cover their territory by traveling from these centers.

CONSTRUCTIVE WORK.

This redivision also will make it possible for the different branch laboratories, instead of devoting their time almost wholly to the policing functions, to give attention to investigational work which has for its aim constructive improvement in the manufacture and handling of foods and the better use of agricultural products.

Special emphasis should be placed upon this constructive work, and it should be the policy not merely to cause violators of the law to be punished, but to prevent the recurrence of violations by so perfecting processes of manufacture that only lawful products will reach the consumer. Saving of waste and economical utilization of products are becoming more and more important; the Government must

conduct such investigations, since they are usually so costly that only the larger industrial corporations can undertake them independently. The results obtained by the Government are published for the use of all. The results of private investigation are either kept secret or patented, and thus give an opportunity for monopoly. The constructive work in this way may be made to supplement the regulatory activity. Punishment under the law will become less and less frequent and necessary when the manufacturer has been taught how to send a safe product to market. The consumer will profit not only from the increased quality of the food but by the lessened cost of production.

HEALTH AND THE FOOD AND DRUGS ACT.

That the food and drugs act is purely economic in one phase and hygienic in the other is not always clearly understood. The wording of the act does not make this distinction clear. Thus, the word "adulteration" is used for the offense of substituting a less valuable though wholesome article in whole or in part for a more valuable one, and also for the addition of a deleterious substance to a food, or the sale of a food which is filthy and decomposed. Obviously the first is an offense against the consumer's pocket. The others may injure his health. In the past relatively more attention has been paid to the economic than the hygienic phase of the act. The most important hygienic task is the proper control of such foods as milk, eggs, oysters, and fish, which may communicate disease. In this connection the cleanliness of food factories or sources of perishable foods which can become infected is most important. The department must combat unsatisfactory conditions in food sources mainly through education, and the policing function in the case of factories and dairies must be discharged largely by the States. It is believed, however, that the department can render assistance in encouraging the States to carry out this work for themselves.

FOOD AND DRUG STANDARDS.

The establishment of legal standards for judging foods would render the food and drugs act more effective, less expensive in its administration, and supply needed legal

criteria. Under present conditions it is necessary in the individual prosecution to establish by evidence a standard for each individual article. This procedure is very expensive, and sometimes its cost is out of proportion to its value. Moreover, it may result in lack of uniformity in different jurisdictions. With legal standards established, the control of foods would be more uniform and measurably less expensive. The lack of such standards is to-day one of the greatest difficulties in the administration of the food and drugs act. These standards, however, should be in the form of definitions, because numerical standards furnish recipes for sophistication. The standards, moreover, should be sufficiently flexible to permit improvements in production. Other serious limitations in the food and drugs act result from that act's definition of "drug." It is impossible to control cosmetics containing injurious drugs, and remedies for obesity and leanness, or to prevent the use of wood alcohol in remedies for external application. The list of injurious drugs which must be declared upon the label is now limited, and authority should be given to require statements of other drugs and the new habit-forming or dangerous compounds which chemists are constantly producing.

FURTHER CHANGES IN ORGANIZATION NEEDED.

Still further changes in organization seem requisite. The Department of Agriculture, like other large institutions dealing with complex problems, has tended to develop into highly specialized groups, with somewhat arbitrary boundary lines, which have been defined more by the methods employed than by the object sought. Such arbitrary divisional lines, separating branches of work aiming at a common result, produce a certain amount of jealousy and assumed conflict of interest and lost motion, leading eventually to stagnation. In the department it has become evident that existing divisional lines are beginning to militate against a desirable flexibility, and have in some cases allowed too little latitude in carrying out important projects. When in the past the department's work was on a purely divisional basis, there was little need for coordination. This divisional basis was changed about 12 years ago into the

present bureau system. The new plan for a time worked well, because the field was then a very broad one and was not covered fully by any single bureau or division. As the work has grown and different divisions have approached the same field, definite handicaps have developed.

What is needed is a basic plan of cooperation, coordination, and broader grouping of the services of the department, according to the purposes in view, each with a larger number of small units, the development of a common feeling, and team work all along the line. Experience demonstrates that small units alone, each more or less interconnected with other units, will yield the greatest results, both in research and in its application.

To capitalize fully the results of research and to make the knowledge gained by the department of service to the people, the department manifestly must put itself in the best possible position to reach with its information the people who must change that information into productive action. To do this it must see that its policing or regulatory functions do not interfere with the gathering of its information, nor with the constructive rather than the preventive use of these data. It therefore must have a plan whereby not only friction is completely eliminated, but whereby it is placed in a position to use to the fullest extent all outside agencies which can carry its information more directly to the people it seeks to serve. Probably this will best be accomplished by having in the department an organization involving five or six main groups, such as a research service, a rural organization service, a State relations service, a weather service, a forest service, a regulatory service, and others as new conditions or special occasion might warrant. With a view to the establishment of some such system the department in its estimates has submitted the following clause for the approval of the Congress:

> The Secretary of Agriculture is hereby authorized and directed to prepare a plan for reorganizing, redirecting, and systematizing the work of the Department of Agriculture as the interests of economical and efficient administration may require; such plan shall be submitted to Congress in the Book of Estimates for the fiscal year 1916; and the estimates of expenses of the Department of Agriculture for the fiscal year 1916 shall be prepared and submitted in accordance therewith.

NEW FIELDS OF WORK.

Heretofore the Department of Agriculture has, of necessity, concerned itself mainly with problems of production. It must give no less attention to these problems for a long time to come; they are still urgent. Increased tenancy, absentee ownership, soils still depleted and exploited, inadequate business methods, the relative failure to induce the great majority of farmers to apply existing agricultural knowledge, and the suggestions of dependence on foreign nations for food supplies, warn us of our shortcomings and incite us to additional efforts to increase production.

The situation is one about which many have become pessimistic, but, of course, there is no ground for thinking that we have yet approximated the limit of our output from the soil. As a matter of fact, we have just begun to attack the problem; we have not even reached the end of the pioneering stage, and have only in a few localities developed conditions where reasonably full returns are secured. With a population of less than 95,000,000 living on more than 3,000,000 square miles it is unreasonable to speak as if our territory had been much more than pioneered. The population per square mile in the Union does not exceed 31, and ranges from seven-tenths of 1 in Nevada to 508 in Rhode Island. It is less than 76 per square mile in any State in the Union, except in eight Eastern States and in Ohio and Illinois; less than 50 in any Southern State; less than 43 in any State west of the Mississippi except Missouri; less than 25 in the great States like Texas, Washington, Nebraska, Oklahoma, Kansas, and California; less than 10 in the Dakotas, Oregon, and Colorado, and less than 5 in most of the Rocky Mountain Commonwealths.

Look at it from another point of view. According to the best statistics available it appears that the total arable land in the Union is approximately 935,000,000 acres; that only about 400,000,000 of this is included in farms and improved; that over 100,000,000 is unimproved and not included in farms; and the remainder is unimproved lands included in farms. But there is another thought. What about the efficiency of the work on the land now under cultivation? What part of it may be said to be reasonably efficiently cul-

tivated? What part of it is satisfactorily cultivated and is yielding reasonably full returns? The opportunity for guessing in this field is unlimited, but according to the best guesses I can secure, it appears that less than 40 per cent of the land is reasonably well cultivated and less than 12 per cent is yielding fairly full returns, or returns considerably above the average.

We have unmistakably reached the period where we must think and plan. We are suffering the penalty of too great ease of living and of making a living. It is not singular that we should find ourselves in our present plight. Recklessness and waste have been incident to our breathless conquest of a nation, and we have had our minds too exclusively directed to the establishment of industrial supremacy in the keen race for competition with foreign nations. We have been so bent on building up great industrial centers by every natural and artificial device that we have had little thought for the very foundations of our industrial existence.

MARKETING.

In dealing with the problems of production, the department has directed its attention mainly to the problem of the individual farmer, and the broader economic problems of rural life have received relatively little attention. It is now becoming clear that we must definitely and aggressively approach these newer and, relatively speaking, urgent problems. We have been suddenly brought face to face with the fact that in many directions further production waits on better distribution and that the field of distribution presents problems which raise in very grave ways the simple issue of justice. That under existing conditions in many instances the farmer does not get what he should for his product; that the consumer is required to pay an unfair price; and that unnecessary burdens are imposed under the existing systems of distribution, there can be no question.

Just what part of the burden is due to lack of systematic planning, or inefficiency and economic waste, or to unfair manipulation, one can not say. As difficult as are the problems of production, they are relatively simple as compared with those of distribution, and there is danger not so much that nothing will be done, but that pressure will be brought

to bear on the department to take action everywhere before it is prepared to act intelligently anywhere. The department has given assistance here and there in the past; it is prepared to give further assistance and information now, and it has shaped its projects and instituted more systematic investigations, which should have results of great practical value to individuals and to communities.

This extension of activity has been made under the act of Congress approved March 4, 1913, which confers the broad authority indicated:

> To enable the Secretary of Agriculture to acquire and diffuse among the people of the United States useful information on subjects connected with the marketing and distribution of farm products.

Let us look at the matter briefly and consider some of the problems that must be attacked in this field. The department has arranged its marketing investigations under five important subdivisions:

First. Marketing surveys, methods, and costs, including especially available market supplies in given production areas, demand at consuming centers, cold and other storages, marketing systems and prices, and costs of wholesale and retail distribution of farm products.

Second. Transportation and storage problems, having in mind the elimination of waste and the study of problems connected with surplus market supplies; terminal and transfer facilities, including freight congestion, car supply, deterioration in transit, extension of the practice of precooling of perishable products, and other special services.

Third. City marketing and distribution investigations, involving a study of the uses and limitations of farmers', municipal, wholesale, and retail market houses; systems of city distribution; the promotion of direct dealing between producers and consumers by parcel post, express, and freight.

Fourth. Study and promulgation of market grades and standards. A consideration of sizes and suitability of packages and containers, methods of preparation of perishable products, and the ultimate establishment, so far as practicable, of official market grades and standards for farm products.

Finally, cooperative production and marketing investigations. The department, as has been said, has already approached the field of marketing through various agencies.

It has established standard cotton grades and has practically completed its standard corn grades. It has given much attention to cold-storage problems and to the packing and handling of perishable fruits. It is aware of the existing chaos and of the consequent wastes—waste resulting from faults on the part of the farmer in the growing and handling of his products; waste resulting from the machinery of distribution, including physical equipment and physical handling; waste resulting from the manipulation of those middlemen who perform no clearly useful and necessary service; and waste resulting from ignorance on the part of the consumer and of the producer of the character of the product which is placed on the market. The producer of any product is entitled to receive an exact price for the specific product which he offers and the consumer is entitled to receive just the commodity he thinks he is paying for.

A failure in either direction involves clear injustice and greatly hampers production and crop improvement. Let me illustrate by reference to two vitally important crops—cotton and corn.

Several different standards of cotton classification are now in use. Some markets have adopted the official grades and use them. Others have adopted them, but do not trade on them. Liverpool has one set of grades, New York another. The former is a great market for both spots and futures; the latter almost purely a future market. Atlanta has its own grades; Augusta's are different. Savannah, handling largely the same character of cotton as the two foregoing, trades on Liverpool grades, using Liverpool middling as a basis. Atlanta middling is equal to Liverpool good middling. In other words, at the present time the same grade name is applied to two qualities that differ in market value as much as $2.50 per bale.

[illegible] one uniform standard [illegible] of all cotton transac- [illegible] ex method of figuring [illegible] fficient to have uniform [illegible] basis grade should be [illegible]

[illegible] grades; the [illegible] secures

the cotton at practically a flat-rate basis on lower grades, grades the cotton himself, and sells it for what it is worth.

There is not only no incentive for placing a good product on the market, but as a matter of fact a penalty attaches to the cotton grower who takes the pains to improve his product.

Uniform standards throughout the cotton belt would result in the rapid building up of a body of common knowledge on the part of the farmers, students in agricultural colleges, and others interested in the universal set of grades. We might hope to educate cotton farmers in sufficient detail to enable them to use one set of grades, but it would be difficult, if not impossible, to teach them grading based on a number of diverse standards, as one can never tell to what market a given lot of cotton is to go. It would be necessary to have knowledge of practically all grades in use.

If in addition these grades were used on the exchanges and the terms of the contract employed were modified, many of the evils complained of by the producer and the consumer in the marketing of cotton would disappear.

Practically the same results would follow and the same evils would be removed if standard grades for corn were universally adopted. Definite standards for the grading of commercial corn and the uniform application of such standards in all markets under suitable Government supervision would be of direct value to our corn growers, in that such standardization would encourage the marketing of dry corn of better quality. Heretofore it has been the common practice to pay practically the same price for all corn delivered at country stations, regardless of its water content or of its soundness. Farmers have not been slow to grasp the situation, and under such a system have naturally made but little effort to market corn in a dry and sound condition. The system has placed a premium on poor and careless farming at the expense of good farm methods and practices.

Under a definite system of grading and the elimination of such terms as "reasonably dry" and "reasonably clean," the farmer, as well as the grain dealer, will be able to know and fully understand the requirements for the different grades With a knowledge of the grade requirements the farmer who markets dry corn of good quality will be in a position to

demand a premium for such corn. It will not be necessary for him to accept a No. 4 price for corn which he sells under a grade designation of No. 3. He will then have some encouragement to exercise greater care in the harvesting, storing, and marketing of his corn; he can likewise ascertain in advance of sale with a fair degree of accuracy the grade of his corn while in the crib, and thus not market it until it is sufficiently dry to meet the requirements of a higher grade. The way will be open for real progress in the movement for the production of more corn of better quality, and farmers who grow corn primarily for market will have an incentive to grow earlier maturing varieties, which will contain less moisture when marketed and can be sold at a premium. Likewise, the country shipper will be in a position to pay a premium for good corn, in that he, in turn, will have the assurance of the same definite system of grading regardless of the market to which he ships.

COOPERATION.

Several things stand out very clearly at this stage of our knowledge. All this waste must be eliminated. In simple justice the producer must be paid specifically for what he produces and for nothing else, and the consumer must receive what he thinks he purchases and must be willing to pay a fair price for a good product. It is clear that before the problems of marketing, the individual farmer, acting alone, is helpless. Nothing less than concerted action will suffice. Cooperation is essential. The same business sense and the same organizing genius which have placed this Nation in the front rank in industry must be invoked for agriculture. Reflection suggests this; experience demonstrates it. All the successful attempts in the marketing of any produce anywhere in the world have come through organized effort. The individual farmer has neither adequate information nor [illegible]

[illegible] cooperation can not [illegible] attempt to establish a [illegible] We shall doubtless con- [illegible] industry as in any other [illegible] be unfortunate. [illegible] which shall

facilitate production, lead the producer to standardize and to prepare his product for the market, and to find the readiest and best market for his product. Such action will result in gain to the producer as well as to the consumer. Furthermore, it is desirable that such concerted action shall proceed from below upward. It must concern itself with the overcoming of a specific economic difficulty in this field of production and distribution. It should associate itself with some particular product which is capable of being standardized. Experience shows that the best results are secured only when the members of such a cooperative society are those who are bona fide producers.

Many enterprises in the United States claiming to be of a cooperative nature have existed and do exist. They are of all sorts and descriptions; some are truly cooperative, others are clearly exploited. Some operate on principles that are sound; others on principles that are obviously bad. A form helpful to one undertaking is not necessarily the best for another, and one successful in one community under certain conditions can not necessarily be expected to succeed under other conditions in another community.

Here, again, the need is for information, and the department, acting in cooperation with the General Education Board, has devised machinery and instituted investigations into this field of cooperative effort at home and abroad. There are many facts to be ascertained. We desire to know and to estimate the various sorts of enterprises afoot in order to be able to give the people information concerning the principles and practices of the best forms of cooperation.

At the earliest practicable moment the department will disseminate the information, and if circumstances warrant and funds are available will assist in making such demonstrations as may be practicable.

RURAL CREDITS.

There is a general impression that our financial arrangements do not satisfactorily cover the rural communities and that there is need of better credit arrangements for farmers. The interest is widespread. It is manifested in many letters received at the department, by articles in periodicals, by the action of various States, and by the thought of Congress in

providing for a commission of inquiry abroad. It is significant that the commission provided for by Congress was accompanied by delegates from practically every section of the Union. The results of the inquiries of this commission are not yet published, but they will doubtless be available in the very near future. For a long time economists have known of the foreign arrangements, but their writings have reached comparatively few people. The report of the commission and the public interest in its trip abroad will give wide publicity to its findings. It was apparent to the department that a knowledge of foreign arrangements should be supplemented by a study of home conditions, and through cooperation with the General Education Board a survey of home conditions was undertaken, and much valuable information has been secured.

It is clear that conditions vary widely in the United States, that farmers do not equally need better credit arrangements, and that all sections are not similarly circumstanced. In fact, from some sections come requests not so much for capital at lower rates as for information as to how to invest capital.

There is considerable variation of the interest paid by farmers on long and short time loans, both as among States and as among different sections in the same area. In the older States of the corn belt, such as Iowa and Illinois, the usual rate on farm-mortgage loans appears to average a little over 5½ per cent, whereas in such States as Montana, Colorado, and Oklahoma in the West, and Florida in the South, the annual charge on similar loans appears to be 8½ per cent or more. Similar variation is apparent in rates to farmers on short-time loans on personal or collateral security. These vary from an average of less than 7 per cent in States like Illinois to an average rate of 11 per cent or more in Oklahoma, Colorado, and Montana. Furthermore, the interest on long-time loans in northern Minnesota exceeds by 3 per cent the usual charge in southern Minnesota. In States like Illinois, where the conditions are more uniform, the variation is slight, ranging from 5½ to 6 per cent between northern and southern Illinois. In the case of short-time loans there are greater variations, ranging from 8½ to 14½ per cent or

more in Colorado and Oklahoma and from 6½ to about 8 per cent in Illinois.

It is not easy to explain just how these variations arise or to decide whether we may more nearly equalize the opportunities for credit in the various sections, and if so, how. There is no one single complete explanation. Many factors enter: Climatic conditions, soil conditions, stability of industry, methods of farming, distances from markets, distances from centers of large wealth, and the nature of financial agencies through which capital is secured all play a part in determining the availability of capital and the rate of interest.

But when all necessary allowance has been made for these fundamental factors, the fact remains that the rural communities are not as efficiently served as they should be by existing financial arrangements. It is not improbable that they can not be as completely served as urban communities are, but improvements can be made. Certain provisions of the pending currency bill have been inserted with the definite view of remedying the defects. What further action should be taken presents a difficult and complex problem. Whether the legislation should be exclusively State or exclusively Federal, or partly State and partly Federal, and whether different agencies should be devised to meet the demand for short-time and for long-time loans are some of the points to be decided.

Long-time loans are needed for permanent investments, such as the purchase price of a farm or for the erection of buildings. In this country the usual method employed in securing capital for such purposes is through farm mortgages. Abroad, in France and Germany, separate financial machinery by means of which capital is rendered available at low rates for permanent purposes has been devised. Bankers in this country realize the wisdom of giving definite encouragement to farmers who borrow money for productive improvements, and the farmer realizes the importance of securing capital for such purposes. Here is presented one of the important problems in connection with rural credits, in some respects the most important. It is wise economy to encourage the extension of credit for safe productive use,

and no less wise to discourage the use of capital along nonproductive or speculative lines. There is no doubt that much capital has been wasted through misdirection and much consequent difficulty presented in the projection of a new scheme. The need of encouraging the placing of capital in the hands of the farmers at reasonable rates for productive purposes is made evident by the rapid increase of tenancy in various sections. We no longer have abundant free homesteads that afford farms and homes for immigrants, as in the earlier days. The rapid increase in farm values and the difficulties in securing land have given impetus to the growth of the renting system. It is this tendency especially that suggests the importance of devising farm loans on terms such as will enable the producers to make the necessary payments on the interest and principal, so far as possible, from the returns of the land itself. The plan of issuing farm debentures has been advocated where the bond issues are blanketed on farm mortgages, and where the latter are issued for long periods of time, running from 10 to 60 years, with the amortization feature attached. Such a plan has operated with success abroad. Some organizations in this country have met with apparent success in this direction. A land-mortgage bank organized as a private stock company and embodying features of the French Credit Foncier has been operated for some time in Illinois. This company lends money on farm mortgages and issues debentures, which are sold to the investing public. The plan most in use by it is to have each thousand-dollar mortgage carry a uniform semiannual payment of $43.26, which covers 6 per cent for interest and enough on the principal to extinguish the loan in 20 years. Each loan is limited to 50 per cent of the value of the farm, and all mortgages are restricted to lands within the State. It would appear that this plan can probably be used safely only where farming has reached a stage of relative permanency and where the conditions are fairly uniform. Under other conditions the investing world may not be willing to look with favor upon blanket debentures unless the financial standing of the institution issuing the securities inspires great confidence. In such regions investors appear to prefer a direct lien on the specific farms regarding which they possess definite information, and here the problem becomes one

of directing effort toward the widening of the market for such mortgages by providing for their resale and repurchase through well-organized and responsible agencies.

In addition to this improvement in facilities for long-time loans through the widening of the market for farm securities, there is another line of effort which may yield favorable results in improving credit conditions. This will involve the drawing more effectively on existing local capital through better opportunities of investment. An interesting example is the familiar building and loan association. The activities of such associations in urban communities are well known. Attempts have been made so to modify such organizations as to adapt them to the needs of the farmers. This is true especially in Ohio, where there are 650 building and loan associations, of which more than 500 furnish loans to farmers aggregating more than $12,000,000. These are found in 82 out of 88 counties in the State. In each of the 82 counties these associations extend loans to farmers at a usual rate of 6 per cent. The loan contracts are reported by the State department as varying from 1 to 16 years, but in nearly all instances the farmers prefer 2 to 5 year contracts with interest payable quarterly or semiannually. This experience may suggest that there is opportunity for the formation of farmers' associations that will stimulate thrift, mobilize local capital, and tend to the increase of owned farms.

What has been stated is, of course, tentative, and is not intended by any means to exhaust the subject. Enough has been said to emphasize the thought that the improvement of rural credit facilities may be solved through several approaches and not by any single agency, and that the full solution of the problem involves the general improvement of agricultural conditions, greater permanency, and greater uniformity.

This second problem is how to improve conditions under which farmers may get short-time loans. Here again we encounter special conditions and special needs. All sections again are not equally circumstanced. The small farmer with little credit, or the farmer who is just getting himself established, is the one to whom attention would naturally be directed. The operations of many of them, taken singly, are too small to engage the attention of those who have capital

to lend, and in many cases the situation is so precarious as to prevent favorable consideration of requests for loans.

It is, of course, requisite that a credit foundation exist; that there should be the usual combination of character and security, but even where these conditions are satisfied the situation is still unsatisfactory. The suggestion of the formation of farmers' credit unions merits serious consideration. The aim of such organizations is not to supply a new banking system but rather to establish a credit foundation or to utilize a collective good will which does not exist so long as the farmer acts individually. In this field Europe has developed beyond us. To what extent their institutions can be followed here needs serious study. It is probable that the unlimited liability feature of some of their schemes will not appeal to American farmers in most sections of the Union. Nevertheless, in those parts of the country where the system of merchants' advances to farmers has brought a great many borrowers into the relation where their individual liabilities to the lenders is already unlimited, it would not seem to be revolutionary to encourage the establishment of local cooperative credit societies and to transfer the features of unlimited liability of the borrower to a group of producers.

The main thing is to develop, either through individual or group action, a credit foundation and a form of security which will attract existing capital, partly perhaps through existing agencies.

In taking action in this field of rural credits it would seem desirable that we bear certain guiding principles in mind. There does not seem to be any real demand or need for action which would do more than provide as adequate financial machinery for the rural districts within practicable limits as [illegible] provided for other sections. There does not appear to be [illegible] for unique legislation or for legislation which shall aim [illegible] the farmer credit on easier terms than other members [illegible] What is needed is the creation of conditions [illegible] which shall enable him on similar credit [illegible] as those that [illegible] classes. Present conditions do not seem to [illegible] proposals to give any class of people capital provided [illegible] the people through any device at lower rates of interest [illegible] conditions normally require or than those

at which other classes secure it under similar conditions. Certainly the American farmers themselves will examine every method of improvement suggested within the fields of self-help before seeking special provision for agricultural industry through national loans or other devices.

OTHER RURAL ORGANIZATION PROBLEMS.

Even though the problem of how the farmer can best sell his produce and can improve the conditions under which he can secure the necessary capital were solved, there would still remain vital things to be accomplished before rural life can be made fully efficient, profitable, healthful, pleasurable, and attractive, and before a larger disposition to remain on the farm develops. Good roads are prerequisite for better marketing, for better schools, and for more comfortable rural living. Better sanitation and hygiene in the home, in the school, and in the community are just as vital for the rural community as for the urban. Many agencies are attacking these problems. It is highly important that the local political machinery shall be more fully vitalized and become more efficient in its care of community welfare.

Much of the work of the improvement of rural conditions lies outside the field of immediate effort of the Department of Agriculture, but it is attacking directly more of these problems than is commonly recognized and will leave nothing undone to contribute directly to their solution. It is clear that much time and great patience are essential and that some of the results desired will come early in the future, many of them as by-products of the work of the various agencies.

The department is giving special attention to the subject of farm management with the view of rendering to the farmer service similar to that rendered to the business man and the manufacturer by efficiency experts and engineers.

It is proposed especially to emphasize the enforcement of the food and drugs act, so far as the law permits, for the better protection of all the people, rural as well as urban. Much of this work must of necessity take the form of constructive education; that is, of placing in the hands of the people and of their officials information necessary for protection, and of giving them cooperative assistance.

This work could be very much extended if the States, in addition to efficient, well-organized State health boards, had machinery extending into each community in charge of full-time experts.

An intimation of the work the department is doing to protect health may be conveyed by reference to its study of insects which carry disease throughout the country.

RELATION OF INSECTS TO HEALTH.

In the case of a number of these insect-pests, they intimately affect agriculture. A striking example is malaria, which prevents the proper agricultural development of enormous areas of fertile land in the United States and greatly reduces the efficiency of plantation labor. The work regarding malarial mosquitoes carried on during the year consists in determining the insect losses which occur and the formulation of plans of control suitable for plantation conditions.

The house fly, known to carry typhoid fever and other diseases of men, has been studied for some time. Recently this study has centered on the discovery of effective and economical methods of destroying flies in their breeding places. The chief breeding place of the fly is the manure heap, and it has been realized that a method must be discovered which will kill the fly and yet not lessen the value of the fertilizer. Satisfactory progress has been made, and an announcement concerning new methods probably will be issued before the end of the year. An investigation of the stable fly, which is an important enemy of live stock and also is suspected of carrying infantile paralysis and other diseases, has been in progress. Studies have been made of the Rocky Mountain spotted-fever tick with a view to the eradication of this pest in a locality in Montana where an especially virulent phase of the disease existed. Still another investigation had to do with the possibility that pellagra is transmitted by insects. This has not yet been demonstrated. If insect transmission is proven, however, another important malady will be added to the list of those which may best be dealt with by controlling the insect carrier.

THE WOMAN ON THE FARM.

The woman on the farm is a most important economic factor in agriculture. Her domestic work undoubtedly has a direct bearing on the efficiency of the field workers, her han-

dling of the home and its surroundings contributes to the cash intake, and, in addition, hers is largely the responsibility for contributing the social and other features which make farm life satisfactory and pleasurable. On her rests largely the moral and mental development of the children, and on her attitude depends in great part the important question of whether the succeeding generation will continue to farm or will seek the allurements of life in the cities.

According to the testimony of many who are thoroughly familiar with conditions, the needs of the farm woman have been largely overlooked by existing agricultural agencies. Endeavor has been largely focused on inducing the field workers to install effective agricultural machinery and to employ the best methods of crop production. The facts that the woman's work and time have a real monetary value and that her strength is not unlimited have not been given the consideration they deserve. As a result, on many farms where there is always money enough to buy the latest agricultural appliance there is seldom a surplus to provide the woman in her productive work with power machinery that will lighten her physical labor, running water that will relieve her of the burden of carrying from the pump all water used in the household, or kitchen equipment and household devices that will save her time, increase her efficiency, and enable her to make important monetary saving.

HOME MANAGEMENT.

The department believes that intelligent help to women in matters of home management will contribute directly to the agricultural success of the farm. It purposes, therefore, to ask Congress for means and authority to make more complete studies of domestic conditions on the farm, to experiment with labor-saving devices and methods, and to study completely the question of practical sanitation and hygienic protection for the farm family.

The farmer's wife rarely has access to the cities where labor-saving devices are on competitive exhibit, nor does she often meet with other women who are trying these devices and gain from them first-hand information. It seems important, therefore, that the department, cooperating with the proper State institutions, should be ready to give the farm home

practical advice. Some work has already been accomplished in studying the problems of nutrition and advising the women in the country as to the economical use of various foods and methods of using these foods to obtain variety in diet. Apparently, there is need also for advice on general diets that will be healthful and varied, because the farm home usually has but a limited number of foods at its disposal and has not the opportunity to add novelties to the diet, such as the city woman finds in her convenient store.

FIELDS IN WHICH HELP IS DESIRED.

To ascertain the fields in which farm women desire specific assistance, a letter of inquiry was addressed to the housewives of 55,000 progressive farmers in all the counties of the United States. This letter asked no questions and left every woman free to discuss any need which occurred to her. She was invited to take the matter up with her neighbors and make a reply which represented not merely her personal need but the recognized need of the women of her community. Replies to this letter have been received in great numbers. Time has been lacking for a complete analysis of these letters, but from those which have been read so far it is evident that women want help in practically every phase of home management, from the rearing and care of children to methods of getting the heavy work, such as washing, done by cooperative agencies. Many women seek means of increasing the precious personal income which they receive from poultry, butter making, or the garden in their care. Many asked the department to suggest new handicrafts or gainful home occupations, and others seek better means of marketing the preserves, cakes, or fancy work that they now produce.

The overwork of farm women and their fear of the effect of overwork on their children is the text of many of these letters. The difficulty of securing domestic help, due seemingly to the fact that daughers of farmers no longer take positions as home makers, has added to the farm housekeeper's burden. Many ask the department to prove to the men that their work is worth something in dollars and cents. Still others express a realization that their own lot is hopeless and self-sacrificingly ask that better things in the way of education, cheaper schoolbooks, improved schools, lectures,

libraries, and museums be provided for their children. Many request that the department establish a woman's bureau, and issue weekly or other publications designed for women and dealing with matters of cooking, clothing, home furnishing, education of children, care of the sick, etc.

POPULARIZING THE DEPARTMENT'S WORK.

The realization that information of great value to the people is being gathered by the department's specialists more rapidly than it could be circulated led to a revision of the system of publication and to the establishment of a special information service.

NEW CLASSIFICATION OF PUBLICATIONS.

It is fully realized by the department that the printed page or written statement, or even the institute address, can never be as effective in getting the farmer to understand and adopt practical methods as the man-to-man cooperative work of the demonstration service. Unfortunately, however, it is impossible at present to reach every farmer even once a year by word of mouth, and it will always be impossible to send direct messages to him to communicate new discoveries without delay. In planning the new system of publications and the information service the aim has been to reach with the least delay the largest possible number with the printed message and to place it in their hands in a form which will approximate as nearly as possible the work of the demonstration agent.

Accordingly, on July 1, 1913, a new plan of publication work was adopted, constituting a decided change in the character and classification of the department's publications, the object being to draw a sharp line between the strictly scientific and popular publications, so as to prevent the waste arising from the miscellaneous distribution of the scientific bulletins and to make a wiser distribution of the popular publications. The confusion which has always existed as the result of a multiplicity of series of publications has been eliminated, so that instead of having no less than 40 different series there are at present but 4, namely, (1) departmental bulletins, in which the popular and semitechnical results of investigations are published, and of which 50 have already been issued; (2) the serial publications (including the Journal

of Agricultural Research, for the strictly scientific papers, and the experiment Station Record); (3) the Farmers' Bulletins, which are to be reduced in size and designed to give specific directions for doing things, with the object of making them more popular and useful; and (4) annual reports and other congressional publications, including the Yearbook and Soil Surveys, all of which are to be reduced in size and made more readable.

The demand for information which the people have a right to obtain from the department was never as great as it is to-day, and the new classification affords an economical and satisfactory way of meeting the requirements of all who are interested in our work.

INFORMATION FOR THE PEOPLE.

The edition of any single bulletin or publication necessarily is limited, and in consequence can reach but a small percentage of the population that could make use of it. In addition, it was found that there was much valuable material which, to be useful, ought to be gotten into the hands of the people within a few days or hours, and which if subjected to the necessary delay of formal printing would be of little service. The Office of Information was therefore established for the purpose of preparing brief popular statements of facts, which are to be supplied to the country. This office gathers these facts from the printed material and from the typewritten report and by direct interview with the specialists. This material is then prepared in simple news form, mimeographed, and given to the papers, particularly in the special districts to which it applies. It is also issued in the form of a weekly letter, which is sent to more than 50,000 crop correspondents and progressive farmers. The notice may take the form of warnings against frauds in seeds and foods, notices of quarantine against plants or animals, advice as to means of combating crop or animal pests, or general information as to the handling of various crops. The several publications to which they are sent apparently are finding that these notices are of interest and value to their readers. The material sent out by this office is limited entirely to making known the facts of discovery and the official rulings of the department.

RELATIONS WITH THE STATE AGRICULTURAL INSTITUTIONS.

Reference has been made to proposed changes in legislation making for closer relations with agricultural institutions within the States, especially the agricultural colleges and experiment stations. It is self-evident that no very sharp line of distinction can be drawn between the functions of the Federal Government and those of the agricultural colleges and stations.

Certain guiding principles, however, may be proposed, and if these are observed there need be no fear of conflict. As might be expected in a country growing as rapidly as ours, where conditions affecting agriculture are so changeable, relations between the institutions within the States and between the State institutions and the Federal department have not always been as satisfactory as might be desired. As the work progresses it becomes more and more evident that the Department of Agriculture has well-defined functions, such as those controlling regulatory matters where interstate commerce is concerned, broad questions of administration affecting the conservation of soils, waters, and forests, studies of meteorology in its relation to commerce, and other problems of this nature. The Federal Government is also concerned with research problems, especially those affecting regulatory matters and the broader administrative questions already discussed. Its research work, therefore, should lie in regional rather than in local fields. The Federal Government accumulates a large amount of information which it should place in the hands of the people, especially the people on the farms and in the farm homes. The States are concerned with educational matters, with research, and with the extension of the results of research.

COORDINATION OF ACTIVITIES.

As the Federal Government makes appropriations for this type of work within the States and is also making appropriations to the Federal department direct, it is proper that all the agencies coordinate their activities in such fashion as will bring the best results and preserve the integrity of the institutions involved. Unquestionably these relations can

be brought about without compulsion of law. They may be accomplished voluntarily by the men in the various institutions directing the work.

In order that a proper understanding of relations might be secured, several conferences have been held with the executive committee of the Association of Agricultural Colleges and Experiment Stations. As a result of these conferences there developed certain views which have been formulated in the following memorandum. This memorandum was signed by all the members of the executive committee and was approved by me.

The executive committee of the Association of American Agricultural Colleges and Experiment Stations desires to express to the honorable Secretary of Agriculture its great gratification at the attitude of his department in its effort to bring about a closer and more efficient relationship between the work of the department and that of the colleges and experiment stations.

(1) The executive committee heartily indorses the suggestion of the Secretary that as a means of inaugurating and perpetuating an intelligent and sympathetic cooperation of these agencies there be established a permanent committee on the general relations of the department and the colleges, said committee to be made up of representatives from both the department and the association.

RESEARCH.

(1) The executive committee cordially agrees with the point of view of the Secretary that the primary function of the Federal department is to undertake the study of problems that are more particularly regional, interstate, and international in character, and that upon the stations should rest the responsibility of investigating the problems that arise within their respective States

This general policy is not to debar a union of effort by the department and a given station in the study of a problem whenever it becomes evident that such cooperation is necessary or will tend to a more successful outcome.

(2) Whenever the department finds it desirable to study a problem within a given State, harmonious relations and an intelligent understanding would undoubtedly be promoted by a consultation between the department and the State's station prior to its inauguration. In case a station is unable to cooperate in the work or does not desire to do so, it should lend sympathetic and advisory support.

(3) Unqualified approval is given to the proposal of the Secretary that in order to assist in the carrying out of the policy of cooperation there be organized a joint committee on correlation of research, to be made up of representatives from the department and the college and station association, one function of said committee to be the preparation for early publication by the department of a list of scientific projects to be undertaken by both the department and the stations. This committee should also be empow-

ered to assist in any feasible way in correlating the work of the National and State research agencies in such manner as shall promote efficiency in securing results.

(4) Equally emphatic approval is given to the plan of holding group conferences between the scientific specialists of the department and the stations. It would seem desirable and perhaps necessary that owing to financial conditions within the association and stations the necessary expenses of such conferences should be met from a fund administered by the department.

(5) It seems to be mutually agreed that in order to make available to students of science the research work of the department and stations and to promote its standing in the scientific world there should be published by the department a journal of agricultural research, such journal to contain only those contributions from the department and stations as are viséed by the committee selected for that purpose.

EXTENSION.

The executive committee approves the policy of unifying the administration of the extension service and is desirous of assisting in securing Federal legislation to that end on the basis of the following principles and conditions:

(*a*) That the extension service shall be administered wholly under the immediate direction of the college of agriculture. State leaders of extension service shall be appointed by said colleges and shall be recognized as college officials.

(*b*) That extension-service projects maintained by Federal funds shall be entered upon only after mutual approval by the department and the colleges.

(*c*) That the funds to be applied to the maintenance of the extension service shall be secured through congressional appropriations made to the Federal departments to be distributed to the several States as provided by law, on the basis of the fundamental provisions embodied in the Lever bill (H. R. 1692).

(*d*) It is understood that the appropriations made for extension service by the several States shall be under their control.

(*e*) It is further understood that the (Federal) moneys appropriated to extension service shall all be expended under the plans and agreements mutually approved by the department and colleges, and that no outside cooperative arrangement for maintaining extension service shall be made with any corporation or commercial body, excepting as a corporation or commercial body may wish to donate funds to be administered in extension service exclusively by the colleges of agriculture in consultation with the department.

Carrying out the recommendations set forth in this memorandum, steps have been taken to organize several committees. The purpose of these committees will be to bring about closer relations with the State institutions and the department.

There will be a committee on relations, a committee on projects and correlation of work, and a committee on publication of research.

As a further result of the conferences and memorandum, the principles set forth with reference to extension have been embodied in a bill providing for such work, which was introduced by the Hon. Hoke Smith in the Senate and the Hon. Asbury F. Lever in the House. This bill, it is believed, will furnish the necessary machinery for bringing about the closest relationship between the department and the several States in the matter of extension service. It will enable the department to coordinate more clearly its work and so to handle it as to have the agricultural colleges as the means by which it is conducted.

PROPER ADMINISTRATION OF HATCH AND ADAMS ACTS.

In connection with the administration of the Hatch and Adams Acts, attention is called to another important matter which should have consideration. Efficient station work demands an atmosphere of fairness and justice and reasonable security to the staff. It furthermore requires stability of policy and the highest possible measure of continuity in work and in personnel. Money spent on discontinued or interrupted projects is usually very largely wasted. The director of the station, as the guiding head, is mainly responsible for the success of the station. A good station and a good director go together. The station director deserves to be sustained and supported by the governing board in carrying out the general policy after it is approved by them. A change in the director is inevitably a temporary shock to the work, often interrupts projects, causes changes in the policy and personnel, and [illegible]eates an era of uncertainty; hence, a change is not justified [illegible]cept when clearly indicated by incompetence or inability. [illegible] discharge of its [illegible]unctions in administering the Federal [illegible]ed, the De- [illegible] cognizance [illegible] a change as [illegible] of director.

[illegible] that the Secretary of Agriculture [illegible] and [illegible]ertify to the Secretary of the [illegible] Territory whether it is comply- [illegible]eceive a

share of the annual appropriation. It authorizes the Secretary to withhold certification, thus suspending payment, and to report the matter to Congress. While the right of the colleges to direct the stations within their States and select the members of the station staff is recognized, radical changes in the personnel or policy of the station, except for good and valid reasons, should, it is believed, be held to be unwarranted interference of the governing board with the conduct of the station. Such action fails to recognize the cardinal principles of efficient administration and places an institution in a position of inability to properly employ the Federal funds. It is believed that such a condition does not warrant the Federal Government in continuing to advance funds to the college or its experiment station, and should lead to the withholding of funds until conditions favorable to their effective use are restored.

REVIEW OF ESTABLISHED WORK.

ADMINISTRATION OF THE NATIONAL FORESTS.

The largest task of the department in forestry is the administration of the national forests. The department is also developing the science of forestry and getting it into actual practice on private as well as public lands. This is being accomplished through demonstration of practical forestry on the national forests, cooperation with States in developing State forest organizations, and assistance to States in protection of forests on the headwaters of navigable rivers, experimental work to determine the best methods of forestry, research in problems of utilization of forest products and saving of waste, and general educational work.

The primary objects of the national forests are to protect the public timber, to produce a continuous supply of timber on lands not required for agriculture, and to protect the sources of water used for navigation, irrigation, water power, domestic supplies, and other purposes.

CLASSIFICATION OF FORESTS.

The department is classifying the national forest lands to segregate those chiefly valuable for agriculture and to establish permanent boundaries of the areas required for the production of timber and for water protection. Every considera-

tion, not only of development of the States but of protecting and increasing the use of the resources of the forests, makes it desirable to further the agricultural development of land in the forests suited to farming. The department is making rapid progress in the classification work and aims to segregate the larger bodies of agricultural land within two years. At the same time the establishment of the permanent boundaries of the areas to be used for forest production and protection of watersheds will enable the concentration of the expenditures in protection, improvements, and reforestation where they will yield permanent results.

Similar work should be done outside the national forests. Public lands valuable only for forest purposes—that is, for growing timber and protecting water flow—are now exposed to fire and trespass and often endanger the forests under protection. Legislation is called for to provide that these lands be classified and added to the national forests.

BUSINESS ASPECTS.

In administering the national forests the department is handling a very large business enterprise. The forests will be made self-supporting as rapidly as possible. Earnings are increasing. The increase for 1913 over 1912 was over $300,000, or 15 per cent. Many forests already return more than their operating cost, and their number will rapidly grow under the present vigorous timber-sale policy. Most of the timber is still far from a market, often requiring the construction of from 20 to 75 miles of railroad by purchasers. With improved conditions the heavily timbered forests will soon yield returns sufficient to meet the deficit on forests held primarily for watershed protection.

FIRE PROTECTION.

The first great task is to protect the forests from injury and destruction by fire. The inflammability of the forests, the long dry seasons, the lack of means of transportation and communication, and the carelessness of many individuals make this work peculiarly difficult. From 2,000 to 3,000 fires a year are started on the forests. Our efforts must be to reduce the number by removing all preventable causes of fire, and to be equipped to handle promptly every fire that starts. The timber alone is worth about $1,000,000,000.

The money spent on protection, a little over 2 cents an acre, is cheap insurance.

THE TIMBER POLICY.

The national forests must be made to grow all the timber that they can; they must supply the needs of the public at as low cost to the public as possible; and they must be so managed as to protect the public against timber monopoly through private control of stumpage or of the manufacture of lumber.

Full production means that lands now unstocked or partially stocked must be reforested and that those now covered by a mature stand must be cut over, with provision for the starting of a new crop. The most pressing immediate need is, next to fire protection, which both safeguards the present stand and promotes reforestation on a great scale, the working over of forests where most of the crop is ripe. Sales of timber are being aggressively pushed and the cut is rising yearly. The timber is sold on terms and conditions which safeguard the public against the evils of speculation and monopoly. Full value for the public timber sold for commercial use is obtained and must be obtained if the Government is not to subsidize those business enterprises which buy the timber.

THE GRAZING POLICY.

The objects of regulated use of the range for grazing are full use of the resource without injury to timber growth and water flow, the encouragement of the live-stock industry, and healthy upbuilding of the West through widely diffused participation in the range privilege by small owners. The success which has been attained in restoring the productivity of ranges depleted by the unregulated competition of former days, in working out methods of use satisfactory both to the stock industry and to the public, in making new range available and learning how to use all kinds of range to best advantage, and in developing the industry along lines which contribute to home building and diffuse prosperity shows what true conservation means.

WATER POWER.

There are very great power possibilities within the national forests. Already there are 76 developed projects and 30

under construction. As the market for power increases there will be a much greater demand than at present, and the Government should make the power sites available under terms which will not only encourage the investment of capital but fully insure the interests of the public. The chief defect of the present law, under which the department is working, is the statutory provision permitting the granting only of a revocable franchise. This law should be changed to allow for the use of land for power purposes, with such provisions as may be needed to protect the investor and the using public.

MISCELLANEOUS USES.

No use of the forests by the public should be refused if some more important use is not at stake. On the contrary, these 167,000,000 acres of our country should be made to yield the largest net total of benefits that can be got out of them. The land can be occupied and is being occupied for a great variety of purposes by a multitude of individuals. When the object sought involves an exclusive privilege, a special-use permit is issued. More than 15,000 such permits are in force. A vastly greater number of persons visit the forests for purposes which require no permit, such as camping, fishing, hunting, prospecting, and similar objects. The number of such persons last year exceeded 1,500,000.

Recreational use of the forests is already of very great importance, and will be much greater a few years hence than it is now. The value of the forests as playgrounds must be recognized and so provided for that the public will always find full opportunity open for such use. To the extent that the law permits, this is being done. Full development of recreation use calls for legislation to permit the department to grant term permits for the occupancy of land for the construction of hotels, summer cottages, and similar purposes, as permits may now be granted for the development of mineral springs.

Recreation use of the forests must be surrounded with safeguards to keep the water supplies of cities uncontaminated, and must be controlled to the extent which the preservation of natural beauty against vandalism and unsightly conditions involve. As public playgrounds the national forests will increasingly have a value for the people of the

country, the importance of which it is impossible to overstate. As protectors of water supplies for domestic use their value will also steadily rise. Already over 1,200 cities and towns draw their supplies from national forest watersheds. Protection both of regularity and of purity of such supplies is an imperative public duty. There is lacking at present adequate authority to prevent water contamination by campers, prospectors, and others. Legislation to enable the department to cooperate with cities and towns in safeguarding the public health through sanitary regulation of the use of watersheds is an urgent need.

IMPROVED HIGHWAYS.

There has been a steady movement for better roads during the past 20 years, with the result that to-day about 24 States have highway commissions or some other State highway agency. A few of these are engaged in educational work, but most of them are expending State money in the construction and maintenance of roads. So rapid has been the growth of this work that, while the total annual expenditure of the States for this purpose amounted to but $2,000,000 10 years ago, it has grown to $43,000,000 in 1912. The results are in evidence in the form of thousands of miles of well-constructed roads in the States which have been most liberal in providing State funds, in a higher standard of supervision, and in more strict accounting for the financial handling of the work.

FEDERAL AID IN ROAD BUILDING.

With the growing interest in road construction and road maintenance it becomes evident that the relation of the Federal Government to this work should be defined. It is believed that the Federal Government should take the lead in investigational and experimental work, having for its object the securing of facts necessary for the most economical methods of road building and road maintenance under the widely varying conditions existing in the United States. There is need for a central agency which can do the highest type of investigational work and can furnish the best information on all problems of road construction and road maintenance—an agency, in short, which shall be able to say the

last word on matters pertaining to the construction and maintenance of roads and to road administration. The department has laboratories for testing and research work, issues numerous publications of an educational character, and employs a group of the best highway and engineer experts obtainable. It has actively aided the States and communities with suggestions or advice and has made demonstrations of its methods as opportunity has offered. The function of the department has heretofore been primarily educational, and as such it has been recognized to be of great value.

IMPROVEMENT OF POST ROADS.

Recently Congress took a step of great importance and significance. Under conditions specified it made an appropriation of a half million dollars, "to be expended by the Secretary of Agriculture in cooperation with the Postmaster General in improving the condition of roads to be selected by them over which rural delivery is or may hereafter be established," and provided that such improvements should be made under the supervision of the Secretary of Agriculture. It made this appropriation contingent on the appropriation of double the amount of money for such improvement by the State or the local subdivision thereof in which such improvement was to be made. As the regular appropriation for the Office of Public Roads is approximately $300,000, it will be seen that the Department of Agriculture has been charged with the supervision of an expenditure for roads of about one and three-quarter million dollars. The time has been too short to determine fully the value of the experiment authorized by Congress, and it has been recommended that it be continued with an increased appropriation.

COOPERATION WITH THE STATES.

The principle of cooperation with the States embodied in the action of Congress referred to is undoubtedly a helpful and wise one. It has heretofore characterized the relations of the department with the States in its educational or demonstrational work. It is believed that if Federal aid is to be further extended in the construction and maintenance of highways any legislation to that end should incorporate this principle. It seems desirable that the Federal Government

should deal with the State as the lowest unit through an expert highway commission as its agency. This policy would eliminate the difficulties of the Federal Government in determining local issues, as well as the danger of undue centralized Government control. In order to stimulate self-help and to prevent undue inroads on the Federal Treasury, wherever Federal aid is extended for construction and maintenance it should be furnished on condition that the States provide an appropriation at least double that voted by the Federal Government. This would furnish an automatic check. The plans should probably provide for maintenance as well as construction, in order to prevent the possibility of the construction of roads many of which may wear out before the bonds placed upon them are paid. What roads should be improved is a matter of great moment. Unmistakably the roads of greatest economic and social importance are those over which the products from the farms can be taken to the nearest railway station and which minister to the other economic and social needs of the community. It would be desirable that no Federal funds should be expended on any project until a scheme of road construction and maintenance within a State had been developed and previously agreed upon by the proper representatives of the State and of the Federal Government. That any money which may be appropriated by the Federal Government should be apportioned on the basis of a number of factors—such as total population, farm population, area, taxable valuation, and mileage—needs no detailed comment.

LEGAL WORK.

Expansion of the department's field of activity during the year has resulted in a material increase in the legal work of the department, both in advice upon fundamental questions underlying the administration of recent acts of Congress and in the preparation of cases for report to the Attorney General under the penal provisions of these statutes.

The provision of the agricultural appropriation act for the fiscal year 1914 regulating interstate and foreign commerce in worthless, contaminated, dangerous, and harmful viruses, serums, toxins, and analogous products and committing to the Secretary of Agriculture the administration of the act

adds another statute in the execution of which important legal questions arise.

Arrangements were perfected during the year for a more expeditious and economical handling of the criminal cases under the food and drugs act and under the insecticide act.

There were transmitted to the Department of Justice 1,048 cases—652 for criminal prosecution and 396 for seizure of goods under section 10. Twelve hundred and fifty cases, including some reported in previous years, were terminated during the year—848 criminal and 402 civil. Fines amounting to $23,463.50 were imposed in 596 of the criminal cases, and decrees of condemnation and forfeiture were entered in 365. The courts have evinced a disposition to impose severer penalties for violations of this act than in the past. Eight hundred and sixty-seven notices of judgment were prepared.

In cooperation with the Interior Department 1,184 cases involving claims to lands within the national forests under the homestead, timber and stone, mineral, lieu selection, and other general and special land laws of the United States were handled. As a result of the adjudication of a part of these cases, 73,000 acres of valuable timbered lands were retained in the forests.

Four hundred and thirty-six cases of trespass on national forests were handled, resulting in the payment into the Treasury of the United States of $27,764.91.

As in previous years, the enforcement of the 28-hour law has proceeded vigorously and effectively. There were reported to the Attorney General 1,037 apparent violations of the statute, 406 more than in the previous fiscal year. Penalties aggregating $61,695 were recovered.

The Court of Appeals for the Second Circuit has held that connecting carriers are bound to make reasonable inquiry as to the length of time live stock have been previously confined in cars without food, rest, and water. This ruling will have a marked effect in the attainment of the purposes of the act.

The department reported to the Attorney General 92 apparent violations of these laws. In 93 cases, including some reported in the previous year, fines aggregating $10,275 were imposed.

The department reported 81 apparent violations of the meat-inspection law to the Attorney General. Convictions were secured in 64 cases, including a few reported in the previous year, resulting in the assessment of fines to the amount of $3,315. In seven cases sentences of imprisonment from 3 to 30 days were imposed.

Increased activity of the department in the matter of enforcing those provisions of the Penal Code regulating interstate commerce in game and wild birds resulted in the submission to the Attorney General of 154 cases, 73 of which resulted in convictions and fines amounting to $3,557.

ENFORCEMENT OF THE INSECTICIDE ACT.

In the enforcement of the insecticide act the department has to do with two classes of insecticides, lead arsenates, Paris greens, and fungicides: First, those which enter interstate commerce or are sold or manufactured within the District of Columbia or the Territories; and, second, those offered for import into the United States at its various ports of entry.

The analyses and testing of official samples and the investigational work necessary to be undertaken have two general objects in view: (1) To secure data on which to base an action under the insecticide act; (2) to develop scientific information with a view to assisting manufacturers in respect to process of manufacture, packing, labeling, and shipping their products so that they will be in harmony with the law.

Efficient enforcement of the act is being obtained by means of prosecutions, and through hearings and correspondence many minor faults in labels have been adjusted without resort to the courts. Signal service has been rendered manufacturers of insecticides, Paris greens, lead arsenates, and fungicides in bringing to their attention scientific information relative to correcting faulty methods of manufacture, faulty methods of analysis, and faulty methods of test, thereby aiding them to place better products on the market, with more correct labels and of more certain standard.

THE FEDERAL LAW PROTECTING MIGRATORY BIRDS.

The act of Congress of March 4, 1913, authorized the department to adopt suitable regulations and to fix close seasons for migratory game and insectivorous birds according to zones. The preparation of the regulations was instrusted

to a committee of three members of the Biological Survey, and after due publication the regulations were adopted and approved by the President on October 1. Under these regulations two zones were established and five forms of close seasons prescribed—a daily close season extending from sunset to sunrise for all migratory birds; an annual close season of 8½ or 9 months for game birds; a 5-year close season for certain game birds in danger of extermination; a perpetual close season for insectivorous birds; and a perpetual close season for birds on two of the great navigable rivers.

The reception of these regulations by the public has been very gratifying. Except in a few localities they have been welcomed. The chief objections have been to the prohibition of shooting after sunset and of hunting on the Mississippi and Missouri Rivers. Their effect has been to standardize the seasons for hunting, to crystallize public sentiment against spring shooting and in favor of a reasonable open season in autumn, and to arouse general interest in the protection of our migratory birds.

The enforcement of the law presents problems even more novel and difficult than the preparation of the regulations. On account of the limited appropriation made by Congress, it is necessary to depend chiefly on cooperation with local authorities. The United States has been divided into 13 districts, each of which will be in charge of an experienced inspector and a limited force of wardens. The inspectors are employed by the department, and the wardens are selected from experienced men on the State forces, but receive only a nominal salary from the department. Through cooperation with other branches of the Federal service and with local authorities much may be accomplished. In the few weeks that the regulations have been in effect the field force has been partially organized in half of the districts, and some interesting results have already been obtained.

FEDERAL PLANT QUARANTINE ACT.

The purpose of the Federal quarantine act of August 20, 1912, is to enable the Secretary of Agriculture to regulate the importation of nursery stock and other plants and plant products, and to enable him to establish and maintain quarantine districts for plant diseases and insect pests and to quarantine

against diseased or insect-infested plants or plant products of foreign countries. The act is being effectively administered by a Federal horticultural board appointed from the Bureaus of Entomology and Plant Industry and the Forest Service of this department, in cooperation with the State, Treasury, and Post Office Departments and with horticultural inspectors of the several States.

All nursery stock offered for entry into the United States comes under two classes: (1) That from countries having an official inspection and certification system and from which commercial importations are permitted, and (2) that from countries which have no system of inspection and certification and from which importations are limited as to amount and permitted only for experimental or scientific purposes. The examination, certification, and other conditions governing importations are now well understood by importers. The Federal act has greatly stimulated foreign countries to do better inspection and to provide suitable legislation to meet our requirements. The result of this is now evident in the much greater freedom from infestation or disease of nursery stock offered for entry. Few instances of serious infestation have been found during the year, which is a marked contrast with conditions prior to the enactment of this legislation.

Under the provisions of the act permitting foreign quarantines four have been promulgated—against the white-pine blister rust of Europe and Asia, the potato wart of portions of Canada and several European countries, the Mexican fruit fly of Mexico, and the pink boll worm of cotton of Egypt.

Under the provisions of the act providing for domestic quarantines four have been promulgated—against the Mediterranean fruit fly in Hawaii, the gipsy and brown-tail moths in New England, the date-palm scale insects in certain counties of California, Arizona, and Texas, and the pink boll worm of cotton in Hawaii. These domestic quarantines provide for the movement of the quarantined articles under a system of inspection and certification, necessitating a considerable force of inspectors, particularly in the case of the Mediterranean fruit fly and the gipsy moth and brown-tail moth quarantines. The State inspection service of California and the inspection service in New England under the

appropriation for moth control have been used in cooperation with this department for the effective enforcement of these two quarantines.

CONSTRUCTIVE RESEARCH AND DEMONSTRATION WORK IN CROP PRODUCTION.

The constructive research and demonstration work bearing directly upon practical agriculture comprises activities that are exceedingly numerous and widely varied in character. There is practically no regulatory work to divert attention from the problems which are of direct and immediate importance to the farmer.

CROWN-GALL OF PLANTS.

Among the distinct achievements in the pathological field is the staining of the crown-gall organism in the tissues of the crown-gall tumor, which is the conspicuous symptom of this widespread and destructive disease which attacks a very wide range of crop plants. Important and significant results have also been obtained with regard to the relation of the crown-gall organism to animal tumors, which it is believed will be helpful to investigators of cancer in man and the lower animals.

As the result of an incidental investigation made in China by one of our agricultural explorers under instructions from the forest pathologist, it has been definitely established that the destructive chestnut-bark disease which is causing so much damage to the chestnut forests in the eastern United States was in all probability brought to eastern America from the Orient.

POTATO DISEASES.

The prevalence to a destructive extent of several new diseases of the potato has greatly disturbed the potato industry in some of the most important potato-producing districts of the Rocky Mountain region. The leaf-roll, curly-dwarf, rosette, and mosaic diseases, which were until recently unknown in this country, are receiving the attention of the pathologists in charge of this line of work.

ARTIFICIAL RIPENING OF DATES.

It has been proved that the artificial ripening of dates can be effectively and cheaply done by merely subjecting the

full-grown, though immature, fruit to a warm and humid atmosphere. This discovery of a simple, effective, and inexpensive method of ripening has greatly simplified the profitable production of some of the choice varieties, such as Deglet Noor, which do not come to full maturity on the tree in the date orchards of the Southwest. An improved method of rooting small date offshoots has been sufficiently developed to indicate that the propagation of choice varieties of dates can be much accelerated, with the result that in future when choice varieties are introduced or originated stock of them can be made available to planters in much less time than is possible with the Old World methods.

COTTON AND CORN STANDARDS.

The increased demand from the public for sets of cotton grades indicates a marked increase of interest in cotton grades standardization. The importance to all legitimate interests of accomplishing as early as possible the universal adoption and use of uniform standards has become clearly evident.

As a result of the studies conducted for several years in connection with the marketing, handling, transporting, storing, and grading of grain, tentative grades for commercial corn have been formulated. Both producers and dealers have recently shown much interest in the subject, and it is believed that the general adoption and use of uniform grades in both our domestic and export trade would constitute a long and important step forward in American agriculture.

FOREIGN PLANT INTRODUCTION AND EXPLORATION.

Agricultural exploration work has been vigorously prosecuted during the year in Siberia and northern China, where search is being made for trees and plants capable of enduring low temperatures and light rainfall. A preliminary exploration of the regions in western South America has been made. This has resulted in the securing of a unique collection of potatoes, which includes some varieties likely to be of distinct value in potato breeding.

FARM MANAGEMENT INVESTIGATIONS.

Important results have been obtained in the study of the cost of producing farm products, the factors which affect the profitableness of farm enterprises, and the best way of organiz-

ing these enterprises so as to obtain the greatest net income. These studies have also made possible the devising of suitable methods of farm cost accounting for farmers' use. Survey records on over 2,000 farms have been secured which give a complete analysis of the farmer's business and show the relative efficiency of labor under different farm conditions.

The systematic study of the organization of farms and of individual farm enterprises has brought a more intimate knowledge of the detailed practices and the limiting factors governing these practices in the farm business, and has made it possible to meet with greater efficiency the increasing demand for plans and specifications for the organization and administration of farms.

FARM DEMONSTRATION.

The effort to aid the farmer through the demonstration method to improve his practice by adopting better methods has received increased attention.

Some of the most effective and most conspicuous results are found in the boys' demonstration work in the South, where 480 members of the boys' corn clubs in the various Southern States produced yields of over 100 bushels of corn to the acre. The work of the canning and poultry clubs, through which the girls of the farm are encouraged to preserve in a form suitable for home use or sale such products as tomatoes and other vegetables and fruits that can be profitably produced for local consumption on many farms has yielded very satisfactory results.

In the Northern States a good beginning has been made in farm demonstration work during the year. This work is prosecuted for the most part in cooperation with the agricultural colleges through county agents, who devote their entire time to the study of local agricultural conditions and needs and act as counselors and advisers to farmers, encouraging the adoption of improved methods and where advisable the introduction of new crops. While the organization and establishment of this work in the North and West is too recent to indicate in any very definite way what may be expected to result from it, a summary of the work of the agents in the 30 counties longest established discloses that more than 6,500 farms have been visited and more than 1,800 farmers' meet-

ings addressed, with an attendance exceeding 130,000. Cooperative work has been carried on directly with nearly 2,400 farmers, many of whom are being encouraged to select and test carefully their seed corn. More than 235,000 acres of corn have been planted with tested seed. Several hundred farmers are following instructions in the growing of alfalfa, clover, and potatoes, and much orchard pruning and spraying have been done as a result of the advice and instruction of the agents. These agents have made plans for the operation of nearly 200 farms, and have organized 65 farmers' clubs, with a membership of nearly 1,500 farmers.

In the boys' and girls' club work in the North and West six State cooperative agents have been employed, who have had the assistance of five collaborators in the conduct of club work. The present enrollment in this work amounts to about 60,000 boys and girls, who are systematically organized into boys' corn clubs, girls' canning clubs, potato clubs, sugar-beet clubs, vegetable-garden clubs, etc. The average yield per acre of all the corn-club members reporting this year was 74.5 bushels, with a net profit of $25.55 per acre; 426 made 100 bushels or more, and 1,078 made over 60 bushels per acre.

SEED DISTRIBUTION.

The distribution of drought-resistant field seeds in the Great Plains area and other dry-land sections of the country has apparently been productive of excellent results. This distribution, which consisted of improved varieties and strains of field crops adapted to the regions of light rainfall, was made in such a way as to provide the farmer with seeds sufficient for an area—usually an acre—adequate to make a practical test of the adaptability of the crop to his conditions. Should it prove superior to the one he is already growing, his initial harvest in most cases will provide him a sufficient supply of seed for a considerable acreage the next year. The beneficial results from this distribution of such field seeds as alfalfa, feterita, kafir, milo, millet, Sudan grass, and other forage crops, and certain cereals suggest the advisability of radically changing the seed distribution so as to accomplish the purpose for which it was originally established, namely, the introduction into practical farming of new and valuable crops needed in the improvement and development of agriculture.

ANIMAL DISEASES, ANIMAL HUSBANDRY, AND DAIRYING.

The department is working in various ways to foster and promote stock raising and to encourage the production of a sufficient and wholesome supply of animal food for the people.

In the control and eradication of animal diseases the department is working in cooperation with State and local authorities. After 15 years of effort sheep scab, which was formerly prevalent throughout the West, has been so nearly eradicated that only a few comparatively small areas remain in quarantine. The stamping out of cattle mange has likewise been nearly completed.

TICK ERADICATION.

The greatest undertaking of this character has been the extermination in the South of the ticks which spread the disease of cattle known as Texas fever. Until recent years the southern part of the United States has been under the blight of these ticks, the infected area extending from Virginia to Texas and including southern California. After seven years of effort more than one-fourth of the territory originally infected has been freed from ticks and released from quarantine, and the work is being pushed vigorously and with good progress in much of the remaining area. The territory released now amounts to 196,395 square miles, being greater than the combined areas of South Carolina, Georgia, Alabama, and Mississippi. At first this work was done against some opposition because of the lack of knowledge of its benefits, but the purposes and advantages are now so well understood that it is meeting with the hearty cooperation of the people of the affected region. The most effective means of destroying the ticks is by dipping the cattle in an arsenical solution. The success of this work is now only a matter of time and money, and with adequate appropriations the extermination of the ticks can be completed before many more years have passed. When this is accomplished a large area which has heretofore produced only a small proportion of what it is capable of raising under favorable conditions will become available for beef growing.

THE FOREIGN MEAT SITUATION.

In anticipation of the increased entry of foreign meat, the department dispatched two of its specialists, one to

South America and the other to Australia (the principal sources of probable imports), to ascertain whether the Governments there maintain adequate supervision of their meat industries. The purpose was to safeguard our people from foreign meat that might be a carrier of disease or that might have been slaughtered under conditions that would not be permitted in the United States. The only countries of South America that are in a position at the present time to ship meats to the United States are Argentina and Uruguay. Both of these countries are conducting a Federal inspection by veterinarians of all animals slaughtered for meat which is intended for export. The inspection is quite competent. There are some minor differences between the systems of inspection there and in the United States, but on the whole the inspection is planned largely after that conducted here, and these minor differences will be overcome. A report on Australia has not yet been received. Rigid regulations governing the admission of foreign meat and meat products have been established and are being effectively enforced.

DAIRYING.

The department is also working for the increase and improvement of the supply of milk and other dairy products, both by means of research and by the dissemination of information.

Within the past year noteworthy results have been obtained in the research laboratories with regard to certain problems connected with the pasteurization of milk, on the cause of deterioration of storage butter, on the causes of flavor in cheese, and with regard to other facts relating to the bacteriology and chemistry of milk, butter, and cheese.

NEW METHODS OF INSECT CONTROL.

The efforts of the department in the matter of insect control have been marked by the discovery of new methods in the handling of the gipsy-moth problem in the forests of New England and by a very satisfactory increase and spread of the introduced foreign parasites of the gipsy moth and brown-tail moth. Further field experiments of a thoroughly practical nature in the control of the alfalfa weevil, an insect which has threatened enormous losses in the West, have

shown such good results that alfalfa growers in the infested territory have secured a fairly good crop of hay throughout the season, while some of the best alfalfa growers in that part of the country now insist that they can secure a larger annual yield than they were able to do before the pest appeared. Demonstrations of the possibility of control of the destructive bark beetles of the western forests have shown that threatened outbreaks can be suppressed in an almost perfect manner and at extremely little cost. The threatened introduction of the Mediterranean fruit fly from Hawaii into the Western States has received careful attention, and at the present time measures are in force which will probably effectually protect the fruit industry of the Pacific States from this pest.

AGRICULTURAL EXPERIMENT STATIONS.

The States have in recent years greatly increased the appropriations to these stations to supplement the Federal funds. The total income of the stations in 1912 was $4,068,240, of which $1,440,000 was received from the National Government. In the same year $1,000,000 was expended for buildings for the stations and about $500,000 for permanent equipment.

THE INSULAR STATIONS.

Gratifying success has been attained in the growing of cereals and vegetables in various parts of Alaska, and the evidence accumulates that there may be considerable agricultural development in that Territory whenever better transportation facilities and the broader utilization of its other natural resources bring in sufficient population to give a reliable market for the products of the soil.

In Hawaii a soil survey is nearing completion and local agricultural industries have been encouraged through the results of scientific investigations, demonstration farms, and associations for cooperative marketing.

The Porto Rico station is giving special attention to the utilization of lands which are unprofitable under the present systems of cultivation. Efforts to aid in the development of the citrus industry are being continued. In 10 years the annual exports of citrus fruits have increased in value from $230,000 to more than $1,100,000. Coffee is receiving much

attention, and it has been shown that by better methods of cultivation and fertilizing the crops can be more than doubled.

In Guam there is increased interest in agriculture on the part of the natives as the result of the station's work. Efforts are being made to improve the live stock of the island by the introduction of pure-bred stock. A large number of tropical and subtropical fruits, vegetables and forage plants are being tested.

IRRIGATION AND DRAINAGE.

The studies of irrigation methods and appliances now carried on in all the irrigated regions and in a number of the humid States are bringing information which will enable the farmers to reduce greatly the waste of water and thus extend the benefits of irrigation to a much larger area. The securing of competent settlers on the great areas of land in the West now coming under the ditch is still the most urgent problem in that region. The department is therefore doing all it can to bring to the actual or intending settlers who are unacquainted with irrigation practices such information as will enable them to undertake this work with success.

Examinations and surveys of about a million acres of land needing drainage have been included in the work of the department during the past year. In this way interest in drainage reclamation is being stimulated over wide areas.

AGRICULTURAL EDUCATION.

The rapid development of agricultural education in the United States, which has been so marked a feature of recent educational progress, is continuing. This has been especially apparent during the past year in the better support given to the agricultural colleges, in the establishment of additional agricultural courses in universities and colleges of private foundation, in the increasing number of States giving financial aid to secondary instruction in agriculture, in the attention given to the training of teachers of agriculture for secondary and elementary schools, in the larger attendance of students at all sorts of colleges and schools in which agriculture is taught, and in the great popularity of certain forms of elementary instruction in agriculture, such as children's

gardens in cities, boys' corn clubs, girls' garden and canning clubs, and other juvenile agricultural-club work.

The department has continued to maintain a center of information on the various phases of this broad educational movement.

THE CROP OUTLOOK.

This statement as to crop yields is in a large measure an estimate. This fact should be constantly kept in mind in connection with the summary here submitted.

CROPS IN THE UNITED STATES.

From the best information at hand it appears that the production of crops in the United States in 1913 was materially below the average, the yield per acre of all crops combined being smaller than in any year of the past decade, with the exception of 1911. This shortage was caused by a severe drought, accompanied by excessive heat during the summer months, in an important portion of the agricultural district of the United States, and particularly in Kansas, Oklahoma, Missouri, and adjacent States.

Inasmuch as crop production in 1912 was unusually large, a greater proportion than usual has been carried into the present crop year, which should mitigate somewhat the effects of the shortage of this year's crops.

The corn crop, the most valuable farm product of this country according to the estimates, fell below 2,500,000,000 bushels, which is smaller than any crop since 1903 and about 660,000,000 bushels smaller than the record crop of 1912. The estimated yield per acre is 23 bushels, compared with a yield of 29 bushels in 1912 and an average yield of about 27 bushels. In only 9 of the past 47 years has the yield per acre been less than 23 bushels.

Wheat production, with an estimated total of 753,000,000 bushels, notwithstanding the general crop shortage, is the largest ever recorded in this country. The crop was practically matured before the drought became effective. The largest previous estimate was for 1901 (like this year, a short-crop year), with 748,000,000 bushels. The production in 1912 was estimated at 730,000,000 bushels. In yield per acre, this year's estimate of 15.2 bushels has been exceeded

five times in the past 47 years. The estimated average yield for the past 10 years was 14.2 bushels.

The oat crop, estimated at 1,122,000,000 bushels, although nearly 300,000,000 bushels smaller than last year's record crop, is the third largest in our history, the crop of 1910 holding second place. There has been a steady expansion of area in this crop. The yield per acre, however, was slightly below the 10-year average.

The hay crop, estimated at 63,460,000 tons of cultivated hay, is nearly 13 per cent smaller than the large crop of 1912. In yield per acre the estimate is 1.31 tons, compared with a 10-year average of 1.43 tons. The lowest yield per acre in the past decade was 1.10 tons in 1911, and the highest 1.54 tons in 1903 and 1905. Rather liberal rains in the late summer and fall have produced good pastures.

The production of cotton has not yet been estimated. Present indications are that the yield per acre will be slightly below the average; but, as the acreage is large, the total production, which will probably exceed 13,000,000 bales, will rank perhaps fourth or third in size.

The acreage devoted to the five crops mentioned—corn, wheat, oats, hay, and cotton—comprises about 90 per cent of the area in all crops, and therefore has a predominating effect upon the general average condition of all crops. Nearly all of the minor crops were materially smaller this year than in 1912, and the per acre yields below their average. The potato crop is estimated at 328,000,000 bushels, as compared with 420,000,000; tobacco, 903,000,000 pounds, compared with 963,000,000; barley, 173,000,000 bushels, compared with 224,000,000; rye, 35,000,000 bushels, compared with 36,000,000; flaxseed, 19,000,000 bushels, compared with 28,000,000; buckwheat, 14,000,000 bushels, compared with 19,000,000; sweet potatoes, 56,000,000 bushels, compared with 55,000,000—in each case comparison being with 1912.

The yields per acre of all crops combined compared with their 10-year average yields in those States which fared most favorably in crop production this year were, if 100 is taken to represent the average: Arizona, 116; Minnesota, 115; Florida, 111; Wisconsin, 110; Virginia, 107; South Carolina,

106; Nevada, 105; Oregon, 105; Georgia, 104; and North Carolina, 104.

Similarly, the yields per acre of all crops combined compared with their 10-year average yields in those States which suffered most severely in shortage were, on the same basis: Kansas, 61; Oklahoma, 62; Missouri, 71; Nebraska, 78; Illinois, 80; South Dakota, 82; Kentucky, 83; New Mexico, 84; Tennessee, 88; and California, 88. The shortage in California is due largely to a freeze of exceptional severity to citrus crops and to drought in the spring of 1913.

To the producers the lessened crop production this year is largely compensated by the increased prices received for their produce, for, although the total crop production is approximately 12 per cent smaller than last year's production, the average level of prices of crops on November 1 is about 13 per cent higher than last year.

CROPS OF THE WORLD.

Distinctive features of "world" crops in 1913 as compared with 1912 are increased areas sown to wheat, oats, barley, rye, and corn. The wheat acreage has probably yielded a record outturn; barley, oats, and rye are bountiful crops, but corn will probably give the poorest result in 20 years. Comprehensive figures for all countries are not available, but the 12 countries which ordinarily produce over 80 per cent of the world's wheat crop have officially returned their aggregate acreages in 1913 compared with 1912 as follows: Wheat, 240,622,000 against 236,685,000 acres; oats, 123,235,000 against 119,027,000 acres; barley, 50,830,000 against 48,219,000 acres; and rye, 97,516,000 against 95,293,000 acres. The increase in the wheat area was almost exclusively in the United States and the Russian Empire; cultivation retrograded notably only in Hungary, Roumania, and British India, due chiefly to meteorological causes.

The wheat yields of the 12 countries in 1913 aggregated 3,398,638,000 bushels, compared with 3,259,600,000 bushels in 1912. The estimated increase of over 150,000,000 bushels in the yield of these countries this season, if finally realized, indicates that the 1913 world crop will surpass all previous records, the total yield of 1912 (3,764,000,000 bushels) having been the maximum up to that date.

The 1913 world oat crop, though not a record, will rank among the largest ever grown. The yield in 1912 totaled 4,582,000,000 bushels, of which the 12 countries produced 3,750,000,000 bushels. Preliminary official estimates make the outturn of the 12 countries for the present season 3,629,000,000 bushels, the shortage being entirely in the United States.

A noteworthy feature of the rye crop of the countries in question is the deficiency in 1913 of the principal rye-producing country, Russia, which reports a crop of only 895,000,000 bushels, against 1,044,000,000 bushels in 1912. In the German Empire, the other principal rye-producing country, the returns indicate a yield in Prussia alone of 375,512,000 bushels, or a 44,000,000-bushel increase over the crop of the preceding season. Increased outturns in other countries are likely to counteract the shortage in Russia.

Preliminary estimates of the 1913 output of barley in such of the twelve countries as report upon this crop aggregate 1,009,821,000, against 1,031,897,000 last year. There is a deficiency, compared with the previous year, of 50,000,000 bushels in the United States and a slight falling off in Prussia, but an increase in the yields of Russia, Hungary, Spain, and France.

The tremendous shortage in the 1913 world corn crop, consequent upon a crop failure in parts of the United States, is coincident with deficient yields in Russia. In other countries of southern Europe the prospect is for a bounteous harvest.

SUMMARY OF THE MORE IMPORTANT FEATURES.

When the Department of Agriculture was first organized, and for many years thereafter, its work was confined to matters directly affecting agriculture. Congress has, however, more recently enacted legislation charging the department with the enforcement of numerous regulatory laws, including those relating to meat inspection, animal and plant quarantine, food and drugs, game and migratory birds, seed adulteration, insecticides, fungicides, etc., many of which only indirectly affect agriculture. Its activities, therefore, now concern, directly or indirectly, all the people.

To carry on the work of the department during the last fiscal year, Congress appropriated $16,651,496 for ordinary expenses, in addition to which permanent annual appropriations, special appropriations, and balances from previous years amounting to $8,303,412.68 were available, making a total of $24,954,908.68. The total of funds which has been or will be returned to the Treasury, together with miscellaneous receipts, aggregate $3,132,303.82. Of this amount there was received from the sale of timber, grazing permits, condemned property, etc., $2,449,287.66, which has been deposited in the Treasury. About three-fifths of the appropriation, or about $15,000,000, was expended for regulatory work, and the remainder, or about $9,000,000, for scientific research, experiments, and demonstrations directly affecting the farmer.

An important change in the system of handling the financial affairs of the department was effected toward the close of the year, which is very satisfactory and results in a saving of time and money.

Several changes in the organization of the department have been effected with the object of developing more complete coordination of the work of the several bureaus and between the department and other Federal departments and State and other agencies interested in agricultural development.

The Weather Bureau stations and substations will undergo gradual reorganization and elimination; this bureau will cooperate with the Hydrographic Office in the publication of various meteorological charts; the research work at Mount Weather will be discontinued and only climatological records made there; the bureau will give more attention to special crop warnings and the forecast service and will include in its scientific work studies of storms, hurricanes, frosts, and cold waves.

The soil-survey work has been made more valuable by the establishment of cooperation with the States, including their experiment stations, colleges, and agricultural bureaus. The department will give precedence in conducting soil surveys to those States which cooperate with it. During the year 19 States have appropriated money for soil surveys under the new plan of cooperation.

The decision of the Attorney General and subsequent action of the Secretaries of the Treasury and Commerce in rescinding Regulation 39 placed meats and meat products under the pure-food law. This necessitated new machinery and some reorganization in the Bureau of Chemistry and made necessary close cooperation with the Bureau of Animal Industry. The general effect was to give the Federal Government control over meat and meat products in interstate commerce and in all stages of transit instead of restricting its jurisdiction to the Federal-inspected meat establishments. Other changes in the bureau are designed to coordinate and improve its work, including the establishment of food and drug standards.

The new fields of work upon which the department has entered include the study of marketing farm products, rural organization, rural credits, rural hygiene and sanitation, the condition of woman on the farm, the popularization of the department's work, and the development of closer relations with the State agricultural institutions along the lines of the plan submitted to the executive committee of the Association of Agricultural Colleges and Experiment Stations at its recent meeting in this city.

The national forests are rapidly being made self-supporting, many of them already returning more than the operating cost. There are great power possibilities within the national forests, 76 projects being already developed and 30 under construction. As the market for power increases, there will be a much greater demand, and the Government should make power sites available under such terms as will encourage the investment of capital and fully insure the interests of the public. The recreational use of the forests should be encouraged.

The trend of the movement for better roads is in the direction of State and Federal participation, and to-day 34 States have some form of highway commission.

The department is cooperating with the Postmaster General in the improvement of selected roads, for which Congress appropriated $500,000 conditioned upon the raising of double that amount by the States in which such roads are located. Construction is now under way on some of these roads.

Fines aggregating $23,463.50 were imposed in 596 cases for violations of the food and drugs act; there were 436 cases of trespass on the national forests, the fines for which amounted to $27,764.91; penalties amounting to $61,695 were recovered for violations of the 28-hour law; violations of the live-stock quarantine acts resulted in fines aggregating $10,275; violations of the meat-inspection law resulted in the assessment of fines aggregating $3,315; convictions in 73 cases for violations of the game laws resulted in fines amounting to $3,557; and fines for violations of the insecticide and fungicide act amounted to $1,100.

An efficiency system has been established in the department affecting all employees, under which advancement will depend wholly upon merit.

A budget or project system for handling all work of the department has been inaugurated, which will make possible the determination of the relative cost of different kinds of work and eliminate duplication.

The work of the extermination of the tick, which is the cause of Texas fever in cattle, has been pushed vigorously in the South, the territory now released aggregating 196,395 square miles. The most effective means of destroying ticks is by dipping cattle in an arsenical solution.

In anticipation of the increased entry of foreign meat, two department specialists were dispatched—one to Australia and one to Argentina—to ascertain whether these Governments maintained adequate supervision of their meat industries. At the present time the only countries in South America in a position to ship meats to the United States are Argentina and Uruguay. Both of these countries are conducting federal inspection by veterinarians of all animals slaughtered for export, and the inspection was found quite competent. A report has not yet been received on Australia.

The production of crops in the United States in 1913 was materially below the average, the yield per acre of all crops combined being smaller than in any year of the last decade except 1911. The corn crop was a little below 2,500,000,000 bushels, the average yield being 23 bushels per acre; the wheat crop, estimated at 753,000,000 bushels, is the largest yield recorded for this country. The oat crop was

1,122,000,000 bushels; the hay crop, 63,460,000 tons; and the cotton crop probably 13,000,000 bales.

RECOMMENDATIONS.

That authority be given to codify existing legislation fecting the department in order to more clearly define its duties and functions, and to prepare and submit to the next Congress a plan for reorganization with a view to broadening the work, unifying its efforts, promoting harmony and economy, and adjusting its relations with the States.

That legislation be enacted for effectively conveying existing agricultural information to the farmer. The methods recommended are embodied in a bill submitted simultaneously in the two Houses of Congress by Hon. Hoke Smith and Hon. A. F. Lever.

That the food and drugs act be amended to permit the establishment of legal standards for judging foods and for a broader definition of a "drug."

That if Federal aid is to be further extended in the construction and maintenance of highways, any legislation to that end should incorporate the principle of cooperation with the States on the condition that the States provide an appropriation at least double that provided by the Federal Government; that no Federal funds should be expended until a scheme of road construction and maintenance within a State had been developed and agreed upon; and that any money appropriated by the Federal Government should be apportioned on the basis of a number of factors.

That the name of the Bureau of Statistics be changed to the Bureau of Agricultural Forecasts, as indicating more clearly the nature of its work.

That the present broad authority for investigating the marketing and distribution of farm products be continued without change and that additional funds be provided.

That provision be made for the establishment of grading standards for various farm products and for the promulgation of the standards already established by the department for cotton and corn grades.

That special consideration be given to the problem of devising better rural credit facilities.

That the law be changed to permit the granting of term licenses on the national forests for the construction of hotels and summer cottages, and for similar purposes, with the view of promoting the recreational use of the forests.

That authority be given the department to cooperate with cities and towns in the safeguarding of the public health through sanitary regulations of the use of national forest watersheds.

That authority be given for the classification and addition to the national forests of public lands valuable only for forest purposes which are now exposed to fire and trespass and which often endanger the forests under protection.

That the law governing the development of water power within the national forests be modified to permit development under terms which will not only encourage the investment of capital, but will fully insure the interests of the public.

That means and authority be granted to make more complete studies of domestic conditions on the farm, including the question of practical sanitation and hygienic protection for the farm home as well as labor-saving devices.

That certain modifications be made in the laws relating to the publications of the department to permit the more efficient utlization of its printing fund.

That increases aggregating $1,074,387 be made in the appropriations of the department for the next fiscal year.

That the salary limit of scientific workers in the department be raised.

Respectfully submitted.

D. F. Houston,
Secretary of Agriculture.

Washington, D. C., *December 1, 1913.*

BRINGING APPLIED ENTOMOLOGY TO THE FARMER.

By F. M. Webster,
In Charge of Cereal and Forage Insect Investigations, Bureau of Entomology.

THE term "farmer," as used in this article, is intended to indicate the husbandman who grows cereals and forage crops, as distinguished from his colleagues, the horticulturist, the truck grower, the cotton planter, and the sugar planter. The grower of cereals and forage crops was the pioneer of the wooded valleys of the East and of the boundless prairies of the West, residing, with his family, in isolated localities, coping, unassisted, with the agricultural problems of his day and condition, and doing battle, single-handed, against the enemies of his crops, whether floods, droughts insects, or what not.

Fig. 1.—Scarab of Usertesen I; 2758—2714 B. C., giving the King's name, Kheper·ka·ra.

The object of the writer is to trace the application of entomology to agriculture, pointing out some of the many obstacles that have confronted the farmer in the task of freeing himself from popular superstitions regarding insects, while at the same time coming gradually into his own in the matter of profiting from the evolution and development of one of the younger sciences.

ANCIENT MISCONCEPTIONS REGARDING INSECTS.

The conceptions, or rather misconceptions, of the ancients with regard to insects were enveloped in superstition and religious veneration. Records of the sacred beetle of Egypt go back at least as far as the year 5000 B. C., and probably even farther. (Fig. 1.) It was the habit of this insect to lay its eggs singly in excrement and to roll this about until it assumed the shape of a ball, in precisely the same way as our own well-known tumble bug (fig. 2), which may be seen on sunny days pushing its ball and burying it in the warm earth, just as its larger Egyptian relative buried hers in the banks of desert sand. In the course of time the egg hatched and the beetle emerged alive out of the sand. It is supposed

that the Egyptians, not knowing of the burial of the egg, believed that the beetle had the power of reviving itself after death, and this supposed belief has frequently been offered in explanation of the sacred character which was attributed to this insect. It has also been observed that immediately after the inundation of the Nile Valley there are as many beetles as there were before the inundation, which probably gave rise in the Egyptian mind to the idea that these creatures had a perpetual life. This belief in the spontaneous development of animal life from the earth or from decaying matter prevailed to a greater or less extent even as late as the early settlement of the Atlantic coast region of the United States.

FIG. 2.—The common American dung beetle or tumble bug in act of rolling its ball. Life size. (Original.)

So tenaciously do the legends of our forefathers cling to us that even now, in the beginning of the twentieth century, if the common opinion were expressed, it would be an almost unanimous condemnation of all insects as being equally horrid, disgusting, and detestable, with the possible exception of the honey bee. Many individuals have as little true knowledge of the origin and development of these creatures as the ancient Egyptians had of the life history of their sacred beetle. Possibly Queen Tyi, reigning about the year 1414 B. C., knew as little of the bee whose image (fig. 3) adorned the marriage scarab—or what might in this day be termed the "marriage certificate"—of herself and her husband, Amenhotep III. An even earlier occurrence of this figure is found upon the scarab of Thothmes II, covering the period from 1516 to 1505 B. C.

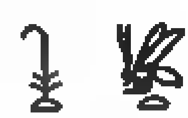

FIG. 3.—A portion of the marriage scarab of Amenhotep III and Queen Tyi; 1414–1379 B. C.

Many insects have been named after Greek gods and goddesses. According to La Hontan,[1] one of the Indian tribes of Illinois had a native moth (fig. 4) inscribed upon its totem

[1] La Hontan is not credited with overmuch truthfulness. However, the Indians, especially the Pueblo and other Indians of New Mexico and Arizona, have a surprising knowledge of insects and their importance.

pole—indicating that moth to be the far-away progenitor of the tribe. Figure 4 is a copy of an illustration in Baron La Hontan's "New Voiages to North America," 2d edition, Vol. II, p. 87, 1735, and described by him as a "butterfly argent on a beech leaf." The latest link in this legendary chain, binding the mystic ages of the past to our own time, may be found in our own nurseries, in the belief of the children that a ladybird alighting of its own will upon them indicates the immediate acquisition of new garments, and in the more gruesome but equally well known "ticking of the death-watch," so called.

There remains in these ancient records enough of fact to give us excellent reason for believing not only that the crops of the early Egyptian farmer suffered from insect attack, but that those of our Aryan ancestors probably suffered equally as they tended their flocks and cultivated their fields on the plains of central Asia four or five thousand years ago. Despite superstition and misconception, the actual economic element in entomology is inevitably as old as agriculture itself.

EARLY RECORDS OF INSECT DEPREDATIONS IN AMERICA.

FIG. 4.—Facsimile of the totem of the Illinois Indians. After Forbes.

As illustrating the transitional stage of this branch of knowledge, the following excerpts from old and only comparatively reliable manuscripts may be given: In the year 1638–39 John Jossleyn, "gentleman," visited New England, coming again in 1663 and remaining until 1671. He reported that in the cornfields of the natives there occurred a "bugg that lieth in the earth and eateth the seed, that is somewhat like a maggot, of a white color, with a red head, about the bigness of one's finger, and one inch or an inch and a half long." Very evidently this was what we now know as the white grub.

Mr. William Wood, who visited this country in 1629, remaining until 1633, stated that the Indians exceeded the English husbandmen in keeping their fields clean of weeds and of "undermining worms." This will give something of

an idea of insect depredations in the cornfields of the aborigines, and will indicate which insects were probably the first to attack the cornfields of the earliest farmers of the United States.

It was not until after this time that Dr. Francesco Redi, court physician to Francis the Second, published the results of his extensive experiments on the generation of insects. This record appeared in 1668, reached a fifth edition in 1688, and conclusively disproved the theory of the generation of insects in dead matter. Up to this time, as stated by Redi, the "generation of these living creatures was considered by all schools to have been by chance; that is, spontaneously, without paternal seed."

It is not to be supposed that the grain fields of the early farmers escaped with less insect injuries than the cultivated fields of the Indians, though during the first hundred years of agriculture in America we have only fragmentary records of the ravages of insects. These records are very incomplete and are such as have of necessity been gleaned from old manuscripts, diaries, and similar documents. Not only are these incomplete, but they appear to have related only to the most disastrous outbreaks, leaving unnoticed a vast amount of injury of which we have, therefore, no record whatever. Some of these fragments of entomological history are as follows: In 1632 "the worms made extensive ravages on the grain;" 1646 and 1649 were "caterpillar years;" in 1666 "the Indian corn was eaten by worms." And as showing that other destructive insects as well as these were probably present, it is to be noted that the canker-worms in 1658 to 1661 made great havoc with the apples in the vicinity of Boston. At that time cutworms and army worms were frequently termed "canker-worms."

By this time ordinary insect outbreaks appear to have become so common as to be thought unworthy of record, and we have nothing more until the year 1743, when it is stated that "millions of devouring worms in armies threatened to cut off every green thing. Hay very scarce; £7 to £8 a load." While this particular record applies to New England, it certainly does not cover the entire area of devastation, as John Bartram, during July of that year, made a journey from Philadelphia to Oswego, N. Y., and records

the occurrence of worms, which he says have done much mischief by destroying the grass and even corn for two summers. He also observes that the worms ate off the blades not only of corn but also of long white grass, so that the stems of both stood naked 4 feet high. He observes that they seem to be periodical, like the locust and caterpillar.

During the year 1749 we are told that in July grasshoppers appeared in myriads, the observer stating: "I reckon my poultry, about a hundred, eat 10,000 grasshoppers every day. The inhabitants of Nahant, Mass., formed a line and with bushes drove the grasshoppers into the sea by millions." In 1762 a terrible drought appears to have occurred, and, owing to a very late spring, corn could not be planted at the proper season. Statement is made that "when at last the corn was planted millions of worms appeared to eat it up."

For upward of a hundred years our records are very incomplete, although there are indefinite references in existence to show that this is not owing to a lack of insect depredations in the fields of the farmer.

In 1770 there appears to have been a widespread outbreak of our common army worm, which, it is stated, extended from Langston, N. H., to Northfield, Mass. These ate wheat and corn and disappeared as if by magic, leaving nothing but the bare stalks of these crops. It seems that the farmers, in order to protect their fields, drew ropes over them, brushing the worms from the stalks, which expedient, we are told, only retarded the devastation, the crops being finally doomed to destruction. Trenches were dug in the fields in advance of the moving armies of worms, but the worms soon filled the ditches, and the millions that were in the rear went over on the backs of their fellows in the trenches and took possession of the interdicted food. Holes were sometimes made in the bottoms of these ditches, one every 2 or 3 feet, into which the worms fell and were then killed by the farmers going over the fields and plunging bars or sticks of wood into these holes. It seems, however, that only a few farmers were able to save enough corn for seed the following year. Just 11 years afterward, in 1781, the same pest is again recorded. It seems also to have reappeared in 1790. Trapping by means of ditches and holes is used in present-day methods of control, but the worms are killed by pouring kerosene into the holes.

PRIMITIVE STATE OF ENTOMOLOGY.

Beyond the crude measures already indicated, which, as will be seen, were at the most but slightly effective, there was nothing that the farmers were able to do to save their crops. An appeal was apparently made for information which would aid them in destroying these pests, but no relief appears to have been received. Indeed, this probably was the beginning, at least in this country, of the unjust prejudice which has since prevailed against scientific agriculture, otherwise termed "book farming." The Angoumois grain moth, an insect accidentally introduced into the United States, committed very serious ravages upon grain, both in the field and in store, in the State of North Carolina. The ravages of this pest reach as far back at least as the year 1728. In 1796 M. Louis A. G. Bosc, who was sent out to this country by the French Government, and resided for some time at Wilmington, N. C., found these moths so abundant there as to extinguish a candle when he entered his granary at night. Although the insect is entirely different from the Hessian fly—the one attacking the seed and the other the plant, the one being a moth or miller and the other a fly—yet, in going over the earlier agricultural journals of the country, these two insects are so confused as in many case to render it impossible to decide to which one the discussions relate. If such misconceptions were to be found among the more educated classes, such as might be represented by Col. Langdon Carter, of Virginia, who wrote on the grain moth in 1768, where was the ordinary farmer to go for information that would help him in his troubles? The few entomologists of that time were almost wholly absorbed in obtaining specimens of insects and in describing [illegible] scientific journals. These entomologists, almost [illegible] exception, knew as little about agriculture as the [illegible] entomology; consequently there was diver- [illegible] been community of thought and [illegible] to indicate the [illegible] history of the [illegible] he earlier miscon- [illegible] occurrence of de- [illegible]

FIELD LABORATORIES AND BREEDING CAGES.

Fig. 1.—Interior of the first field-station laboratory to be established for the exclusive investigation of grain and forage insects; located at Tower City, N. Dak. Fig. 2.—Investigation of Hessian fly in grain fields at Tower City, N. Dak., field station, showing the field breeding cages within which various experiments with Hessian fly are carried out. Fig. 3.—The entomological laboratory at Greenwood, Miss., illustrating the utilization of a small dwelling for this purpose, on the outskirts of Greenwood.

FIELD LABORATORIES.

Fig. 1.—The laboratory at Tempe, Ariz. Fig. 2.—Laboratory building and out-of-door breeding cage, built especially for this purpose, located at Nashville, Tenn. Fig. 3.—Laboratory at Hagerstown, Md., showing the utilization of half of a double house for this purpose.

FIELD LABORATORIES.

Fig. 1.—Laboratory on Kensington Avenue, Salt Lake City, Utah. A different form of building but also easily convertible into a modern cottage. The staff of this field station is shown in front and the principal investigation at this point is with the alfalfa weevil. Fig. 2.—Laboratory built by a private individual at Elk Point, S. Dak., and leased to the Department of Agriculture. This building admits of being easily converted into a small cottage in case it should at any time be no longer desired for laboratory purposes. Fig. 3.—Laboratory at Wellington, Kans., a private cottage leased to the Department of Agriculture. Fig. 4.—Out-of-door breeding cage in connection with the Wellington station. This arrangement gives to the interior conditions as near to those out of doors as it is possible to obtain.

FIELD LABORATORY AND BREEDING CAGES.

Fig. 1.—Laboratory at Brownsville, Tex. This consists of the cavalry barracks of the abandoned Fort Brown, transformed into an entomological laboratory, thus combining the pursuits of war and peace. Fig. 2.—Showing insectary and breeding cages connected with the laboratory at Brownsville, Tex. Fig. 3.—Illustrating the out-of-door breeding cage at La Fayette, Ind., and other equipment at that point for the close study of cereal and forage insects under as nearly natural conditions as possible. All such experiments are checked by others carried out in the field. Fig. 4.—The out-of-door breeding cage at Columbia, S.C., where experiments similar to those in progress at La Fayette, Ind., are being carried out.

CAMP LABORATORY ON THE NEW MEXICO RANGE.

FIG. 1.—An improvised insectary for the careful study of the range caterpillar and the introduction of and experimentation with its parasites. FIG. 2.—Camp near Koehler, N. Mex., established in the midst of a 100,000-acre cattle range, for the investigation of the range caterpillar. FIG. 3.—Hibernating cages used in connection with studies of the range caterpillar.

COLLECTING AND DISTRIBUTING PARASITES OF INJURIOUS INSECTS.

Fig. 1.—Illustrating the artificial propagation of certain parasitic insects, at Glendale, Cal., for distribution to and colonization at distant points. Fig. 2.—Peasants who collected alfalfa stems for the Bureau of Entomology in the fields of Italy. Fig. 3.—Selecting out the stems containing parasites of alfalfa weevil and preparing them for shipment to the United States. Fig. 4.—Liberating the imported parasites of alfalfa weevil in the alfalfa fields in Utah.

FIRST EFFORTS FOR THE PROTECTION OF PLANTS FROM INSECTS.

The first efforts looking toward the protection of cultivated plants from insect attack consisted largely, if not indeed entirely, in the treatment of garden vegetables with soot, ashes, lime, and later, perhaps, white hellebore, but the use of these evidently did not extend beyond the garden and afforded no relief whatever to the grower of grains and forage crops. The spread of the Colorado potato beetle eastward from the West probably did much to introduce Paris green as an insecticide, but its use was confined largely to the truck grower and gardener. To the broad acres of the grower of grains and forage crops it afforded no relief whatever. Still later the work on the cotton worm of the South brought kerosene emulsion into practical use, but even this gave no assistance to the grower of grains and grasses. Although the spraying of trees and shrubs was begun a little later and virtually began a new era for the fruit grower, yet this, too, left the ordinary farmer with his problems of insect control practically unsolved and himself rather in the rôle of an amused though skeptical spectator.

BEGINNINGS OF THE APPLICATION OF ENTOMOLOGY TO GRAIN GROWING.

Nevertheless, the efforts toward the control of the Colorado potato beetle, the western migratory locust,[1] and the cotton worm in the South, although not directly applicable to grain growing or to the individual activities of the farmer, were not without their effect upon him. The same may be said of the work of the writer in the lower Mississippi Valley during the years 1886 to 1890, looking toward the control of the buffalo gnat. This pest occurred in such overwhelming numbers as to destroy thousands of head of live stock, and even to kill the mules drawing street cars in the city of Memphis, Tenn. While it had nothing to do with the cultivation of grains, it

[1] The western migratory locust was the first insect pest to receive attention in the United States with a view to its destruction over wide areas. This outbreak occurred during the years 1873 to 1876, inclusive, and covered more or less completely the States of Idaho, Montana, Wyoming, North Dakota, South Dakota, Minnesota, Iowa, Missouri, Nebraska, Kansas, Colorado, Oklahoma, and Texas, or a territory embracing about 2,000,000 square miles. Congress made an appropriation of $25,000, covering the expenses of the Entomological Commission, to investigate the outbreak.

did affect the farmer in that in many cases it swept his horses and mules out of existence just at the time in the spring when he needed them most. A study of the cause of these outbreaks revealed the fact that relief lay in completing the levees of the Mississippi River between Cairo and the mouth of the Red River; for as these gnats develop only in running water, the overflow from the river into the bayous for miles inland provided the most favorable conditions for their development, and from these breeding places they were carried great distances to farms by the winds. The levees were completed, and since that time it is doubtful if a single head of live stock has been destroyed by these pests.

It was only gradually that the farmer came to seek help from entomology. Up to the year 1884, when the writer was appointed a special agent of the old Division of Entomology, the Department of Agriculture received scant funds for the purpose of aiding the farmer by bringing applied entomology within his reach. About all that the department employees could do under these conditions was to write letters in reply to such requests for information as came to them.

Before the advent of experiment stations—and there were few of these prior to 1888, and even for some time afterwards, because many of the men who are now prominent in station work had yet to be educated—letters addressed to members of university faculties complaining of the ravages of insects and asking relief brought the farmer little consolation. The replies he received to his appeals for relief were usually expressed in a language that he did not understand. Moreover, they were usually written by men who had little or no practical knowledge of agriculture. Thus the breach already existing between the farmer and the scientist was continually widened and in many cases there was fostered an absolutely intolerant feeling on the part of each for the other. The real practical value of applied entomology to the average farmer at that time was perhaps best measured by the frequently used illustrations of Cupid with an insect net chasing butterflies. The measures for reaching the farmer and helping him in his troubles were far from being satisfactory. He was still very much a disinterested spectator. Nor was the fault entirely with the scientist, for the farmer himself has been hard to reach. Indeed, at that time

the writer could easily place in three classes the farmers to whom he was endeavoring to bring entomological aid. The first class, much the largest in number, consisted of those who looked upon the whole matter as a case of one person (the author) holding down and continuing to hold down a good job; the second, those who considered it a case of "the blind leading the blind;" and the third, much the smallest class, those who really understood the aid which the Government was trying to extend to them, and fully appreciated it. An instance or two will serve to illustrate this last-mentioned class: The author had spent an hour with a certain farmer in his wheat field. At the end of that time the farmer remarked that he had been growing wheat all his life, or at least for more than 50 years, and yet in that one hour, with a trained observer, he had been led to see things which he not only had never seen before, but of the very existence of which he had never dreamed. He further admitted that because he had not known what was going on in his own fields he had been losing money during all of those years. A millionaire banker and farmer once took the writer to his 18,000-acre farm to investigate what was, to him, an entirely new insect, but which had practically ruined hundreds of acres of his corn. It so happened that this was the western corn rootworm, which, while its work is exceedingly obscure and connections between worm and adult difficult for the farmer to observe and understand, is withal one of the easiest of all corn insects to manage by a simple rotation of crops. After spending a day in the cornfield he stated that had he known a year earlier what he had learned in that one day it would have saved him $10,000, and he estimated that the information would save him that amount annually in the future. However, another case of a similar nature turned out somewhat less happily. In this case the farmer was almost equally wealthy and carried out with equal faithfulness the recommendation for the rotation of crops, the ground where the corn had been destroyed being seeded the following spring to oats. Moreover, the experiment, so far as the destruction of the corn rootworms was concerned, proved equally effective. Yet the next year, as the writer was walking the streets of a near-by town, a heavy hand was laid on his shoulder and the owner of the hand—the farmer in question—accused him

bluntly of not having known what he was talking about, because "the same thing that had destroyed the corn had turned into a worm an inch long and destroyed the oat crop!" This man said quite frankly that unless the writer could furnish better information, the sooner the Government got rid of him the better. When the farmer had been convinced that the corn rootworm of one year could not possibly develop into the army worm of the next, the difficulty was somewhat smoothed over. However, the average farmer is still almost invariably distrustful of one who has not been brought up on a farm or who has merely had the training of a university, and it is still with no little difficulty that he can be reached by either Government or State entomologists unless he is first convinced that they have a practical knowledge of agriculture. That he is not without excuse for this state of mind has already been shown.

After a lapse of over 30 years, and in an adjoining county, a soil expert has recently been employed with the primary object of examining the soils and giving the farmers advice as to what elements are lacking and how their soils can be best improved. In carrying out his work this expert has encountered a most astonishing condition with reference to corn culture, as, in very many instances, instead of chemical defects in the soil it has been found that failures in producing satisfactory crops of corn have not been due to soil defects at all but to the ravages of this same western corn rootworm. At the present time the writer, by aiding this soil expert, is making every effort to enlighten the farmers, now largely of another generation, as to the actual cause of their failures and the thoroughly practical measure, a simple rotation of crops, that will enable them to overcome it. By this means it is expected that, with the aid of two sciences instead of one, practical results will be obtained that will bring about a saving of thousands of dollars to the farmers of this county.

THE INTRODUCTION OF ENTOMOLOGICAL FIELD STATIONS.

The latest and most practical development in the work of bringing applied entomology to the farmer is found in the entomological "field stations," so called, which have been established in various parts of the country. When entomology was first applied directly to farming problems, ento-

mological workers, both State and National, were few and widely separated. Cooperation, except in rare cases, was impossible, and each investigator devoted himself to the study of such insects as occurred in his immediate neighborhood. No other course, indeed, was open to him. It was frequently the case, however, that the insect which he was investigating was not confined to his own locality, or even to his own State, but was distributed over a wide area, and existed under widely varying conditions of soil and climate. Thus, when the results of his investigations were published, farmers in whatever section of country the pest occurred at once attempted to put into practice the recommendations which the entomologist had made for the control of the insect and which were necessarily applicable only to that section of the country in which the investigations had been made. When, as might be expected, the results of the application of these recommendations were in some cases not all that could be desired, the entomologist got the blame, in spite of the fact that it had been obviously impossible for him to carry on investigations in more than one place at a given time. It was to meet this need for local investigation and experimentation in the broad, interstate investigations that these field stations were established, the first effort in this direction being made in the spring of 1905, when an entomological laboratory for the exclusive study of cereal and forage insects was located at Tower City, N. Dak. The interior of this laboratory is shown in Plate I, figure 1, while the field equipment, consisting of field cages in which were carried on investigations of the Hessian fly in its attacks upon spring wheat, may be seen in Plate I, figure 2. At that time it was doubted in some quarters that this insect did attack spring wheat, but that it does do so was fully demonstrated by the aid of these rather primitive facilities, as was also the fact that durum wheat is practically immune to its attacks. In the same year a laboratory was established at Richmond, Ind. The laboratories at that time each consisted of but a single room in a dwelling house, the work done therein being supplemented by more or less extensive field experiments. The principal work done at Richmond was in studying the spring grain-aphis, or "green bug," for which work Congress had made a special appropriation.

DEVELOPMENT OF ENTOMOLOGICAL FIELD STATIONS.

Since that time we have far outgrown these primitive arrangements, and a small dwelling house is often leased entire, such as the one at Greenwood, Miss. (Pl. I, fig. 3), or Tempe, Ariz. (Pl. II, fig. 1). As the work expanded, more room in these laboratories became necessary, and more commodious quarters were therefore obtained, as seen in the laboratory at Nashville, Tenn. (Pl. II, fig. 2), or the one at Hagerstown, Md. (Pl. II, fig. 3), where the half of a double house is utilized for this purpose, and by the one at Wellington, Kans. The last is shown in Plate III, figure 3, while the out-of-door breeding cage, in which insects are reared under conditions as near as possible to those in the fields, is illustrated in Plate III, figure 4.

Where satisfactory buildings can not be leased for this purpose, real estate men or contractors are usually willing to erect buildings suitable for our purpose, leasing them to the Department of Agriculture. Such an arrangement is illustrated by the laboratory at Elk Point, S. Dak. (Pl. III, fig. 2), and the one at Salt Lake City, Utah (Pl. III, fig. 1).

At Brownsville, Tex., the building formerly occupied as a cavalry barracks at old Fort Brown was, upon its abandonment as a military post, placed at the disposal of the department and was fitted up as an entomological laboratory. The building is shown in Plate IV, figure 1, and the out-of-door breeding cage in figure 2 of the same plate. In some cases universities have been kind enough to give us necessary laboratory quarters in their buildings and ample facilities for outside work. An instance of this sort is found in the work at Purdue University, La Fayette, Ind. (Pl. IV, fig. 3), while another is seen at the University of South Carolina, Columbia, S. C. (Pl. IV, fig. 4).

A laboratory entirely different from those previously mentioned was established in the spring of 1913, when it became necessary to carry on investigations in the midst of a 100,000-acre cattle range, miles away not only from the nearest town but from the nearest human habitation. A field camp (Pl. V, fig. 2) was therefore located at a point not too far from the small mining town of Koehler, N. Mex. The temporary field laboratory is shown in Plate V, figure 1. The breeding cages necessary to this work in the develop-

ment of parasites that had been previously imported from Europe are seen in Plate V, figure 3. This field station and laboratory in the open range is a very modern innovation and something that could not, by any possibility, have been inaugurated and carried out 10 years ago, not only because at that time funds were not available for such an undertaking, but also because of the fact that public sentiment would not have offered any encouragement looking toward this particular piece of work.

Another phase of the work of bringing aid to the farmer is illustrated in Plate VI, figure 1, where are shown breeding cages for the rearing of parasites artificially, the parasites to be shipped to distant points and there liberated in the fields, with the view of thus destroying insect pests of the wheat field. In this particular case the parasites, through the courtesy of this Government to the British Government, were consigned to the official entomologist of British East Africa.

A parasite of the alfalfa weevil, a European insect that was accidentally introduced in the vicinity of Salt Lake, has by the reverse procedure been brought from the native home of the species in Europe and liberated in the alfalfa fields of Utah. Plate VI, figure 2, illustrates a party of Italians employed in their native country to collect alfalfa stems likely to contain parasitized eggs of the weevil. Figure 3 of the same plate shows another group charged with the more responsible duty of selecting for shipment to this country all stems known to contain such eggs. After they had been developed artificially in the laboratory at Salt Lake City the parasites were liberated in fields of alfalfa that had become infested by the alfalfa weevil. Plate VI, figure 4, shows the manner in which this was done.

PRACTICAL VALUE OF THE FIELD STATIONS TO THE FARMERS.

As evidence of the practical value of these field stations, it may be stated that farmers and stockmen are coming more and more not only to make use of these stations by telephone, but also by taking members of the staff of assistants to their own farms. They are also acquiring an intelligent interest in the more technical features of the laboratory work. Time was when a farmer, seeing an experiment carried on under

a lantern globe, would have become so utterly disgusted as forever to forswear all interest in that particular kind of work. Now, however, he pursues an entirely different course. Not only does the insect pest itself interest him, but he also cultivates a business acquaintance with its parasites and other insect foes, for he is beginning to understand that there are really more beneficial than harmful insects, and that the former are his friends. He therefore likes to see the experiments at short range, and when he returns to his own fields he is all the better able to detect the presence of the pest if it occurs.

We have found, too, that one of the most satisfactory methods of bringing applied entomology to the farmer is to carry out field experiments in places where these experiments can be easily observed. We have made it a point to let the farming community know exactly what we are trying to do, and to explain carefully the measures that are being carried out. By watching the experiments themselves, knowing just what we are trying to do, how we are doing it, and the object in view, the farmers are able to see precisely what results are obtained. This work, carried out in their own locality, under local climatic, geographic, and agricultural conditions in their own fields, shows them much more clearly than could otherwise be explained that what we can do they themselves can do. In such cases negative results are to them of as much value as positive ones. This must not be confused with mere demonstration. It is actual experimentation with the farmer taken into partnership and really paves the way for the demonstrator and extension worker.

Another most important point with reference to this matter of personal contact with the farmer is that he is still, generally speaking, strongly averse to reading about insects that may or may not attack his crops in the future. He can not by any possibility bring himself to take an interest in such matters. As one of them explained, "It is all right for you people who understand these things, but for us farmers it is very much like attempting the management of a Krupp gun." We have found that after there has been a personal examination of fields—and this sometimes involves a whole community—the farmers frequently, either individually or collectively, are then ready to read almost

anything put before them relating to these particular pests or their parasites, because they have seen them working in their own fields and have seen also the results of such work. It seems that then, and not before, is the time to place entomological literature before the farmer. It is only a different phase of what we all experience at some time or other, and which may be illustrated by the well-known fact that while we may for years have been reading about a certain interesting or historic locality, it is only after visiting the place and becoming personally acquainted with it that the descriptions become really interesting to us, and it is then that we desire to gather up and reread whatever we have regarding it.

There is one more point which must be brought out in connection with the practical value of these field stations. The farmers' institutes have accomplished a great work, and it is no criticism against them to call attention to the fact that very many farmers will sit through an institute meeting, listening intently, but will ask no questions and give no experiences. Somehow it seems as though a body of people brought together in this way gives the average farmer a species of lockjaw. Yet these same men, interviewed in their own fields by some one who fits in with their life, immediately re-acquire the power of speech and give out information freely, often supplementing the knowledge acquired by the entomologist in his laboratory. If these field stations accomplished nothing more than this they would repay over and over again the funds annually appropriated for the work.

But it is largely through the work and efficiency of these field stations that entomology as applied to the farm has been, within the last 25 years, completely revolutionized. Through their comparative accessibility to all sections of the country it is now possible, when complaint is made of an insect outbreak of more than local importance, to wire instructions to an expert stationed at the field station nearest to the point of outbreak, charging him to proceed at once to that point and investigate the trouble at first hand. Thus the farmer who has made application to the Department of Agriculture for assistance, either directly or, as is frequently done, through his representative in Congress, is often surprised to receive, instead of an impersonal reply by mail, a "living epistle," as it were, in the person of a young man who by training and experience is fitted to assist in con-

trolling the pest. This young man, expert both in entomology and in agriculture, goes about with the farmer over his fields and over the fields of his neighbors, pointing out to them, in a perfectly natural and intelligible way, things which have been mysteries to them heretofore. He shows them wherein their farming methods have been responsible for losses due to insect attack in the past and how, by suitable cropping systems and methods of cultivation, such losses may be averted in the future; thus, again, clearing the way for actual extension and demonstration work.

It must be borne in mind that the men connected with these field stations are working as a unit and not as isolated and independent individuals and upon interstate and not local problems, regardless of State boundaries. Securing facts in New England and attempting to apply them under the agricultural conditions existing in Texas, Montana, or Florida is neither good entomology nor good agriculture. These men do not recognize State lines at all, nor are they bound by them, and the same insect is studied throughout its entire area of habitation, under every climatic, geographic, and agricultural condition. In this way it is possible to meet the farmer on his own ground and show him what he can do in his own locality, under his own agricultural conditions and cropping system, as compared with merely telling him what someone else has done a thousand miles away and perhaps only in the restricted area of a garden patch. The comparative advantages of these two methods of handling the insect problems of the farmer are too obvious to need discussion.

As has already been stated, these men are not demonstrators but investigators, whose duty it is to work out the full life history and habits of insects destructive to grain and forage crops at the various fully equipped field laboratories nearest to the localities where these ravages occur. Having secured such information in this manner, it must be thoroughly tried out in the fields over wide areas under ordinary farm conditions, otherwise we shall be exactly where the earlier entomologists were a half century ago. When final results are obtained, these are available for use by experiment stations, demonstrators, or other experts, and will be found applicable throughout the entire area of destructive abundance of such insects.

In such work State boundary lines fade away, and instead we recognize only the boundaries of distribution of each particular insect and upon which the activities of such members of the force as become necessary can be concentrated. We thus are able to get finished and complete results instead of fragmentary ones, and do for several States what they are not in a position to do for themselves.

It is not expected that these men shall devote their attention to strictly local outbreaks of insects, but to such as extend over more than a single State. Thus, avoiding local matters, they are better able to bring a greater power to bear upon interstate problems, and it is due to present conditions that it has been possible to bring this factor into action. The same insects may be, and sometimes are, destructive in one section and harmless in another. They may, and some do, attack one crop in one locality and another entirely different crop in another, or they may attack the same crop differently under different environments. They may, and some of them do, originate each year in the extreme south, and later in the season commit serious and widespread ravages far to the northward; and it is only through national measures that such conditions can be reached and remedied.

In cases where details for special investigations are requested by Members of Congress, it is always left to the judgment of the entomologist in general charge of the section from which the detail is to be drawn to decide whether a personal examination is necessary, whether the interests of the Department of Agriculture will be benefited in its researches in this way, whether in view of the general distribution of the pest and possibilities of danger from it in future, more extended investigations are necessary, or whether the matter is not a local one which can be handled equally well by State authorities.

Thus it is that applied entomology is being rapidly brought more and more to the farmer himself, in his own fields, and we are able to reach out to him to an extent that has never before been possible; and he is fast coming to realize that while he may have been, owing to previously existing conditions, the last to benefit by this somewhat difficult science of entomology, he need not, by any means, be the least profited thereby. There does not seem to be any reason why

this work should not be extended until every farming community can be reached and benefited. Indeed the term "community" is hardly applicable in this sense, for even the most extended stock range of the West is not necessarily debarred from securing equal benefits.

It must not be supposed that all of the activity in applied entomology is being confined to cereal and forage insects, because those affecting fruits, truck, and other crops are also receiving attention. That the United States is far in advance of other nations in the practical application of the science of entomology is evidenced by the fact that entomologists, both students and experts, from all quarters of the world come to this country for the purpose of studying our system and methods of work. Many of these are being aided financially by private philanthropy, while others are sent here by foreign nations at public expense.

Thus it is that by the aid of Congress and under the fostering care of the United States Department of Agriculture the mysticism and misconception regarding insects that have prevailed among farmers, and indeed have followed them throughout their migration from east to west, for centuries, are being swept away and the twentieth century is to see the farmer profit equally with his brother husbandmen from a practical knowledge of insects and their habits and learn how, when, and where they can best be reached and controlled by practical measures intelligently applied.

ACTORS OF EFFICIENCY IN FARMING.

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ist in Charge of Farm-Management Investigations, Bureau of Plant Industry.

INTRODUCTION.

ı are available for the discussion of only a few of ıe factors which contribute to the success of a farm . Among the more important of these are the ıde of the undertaking, which may be measured by ı farmed, the amount of working capital employed, ımount of productive labor provided; the system of ıtion, which determines the degree of diversity of ses on the farm, the seasonal distribution of labor, amount and character of equipment required; the ility of the chosen enterprises (crops, types of live tc.) to soil, climatic, and economic conditions; the of the business, as indicated by yield per acre or per animal unit; and, finally, the individuality of ıer himself. Each of these is discussed briefly.

MAGNITUDE OF THE BUSINESS.

ıportant factor in determining the amount of income ıer can secure is the magnitude of the business he s. Other things being equal, the larger the business ıter the possibility of profit. But it is also true that er the business the greater the possibility of loss. It ·tant that the magnitude of the business should not the managerial ability of the owner or tenant, as the y be, but within this limit it is easier to make money ge farm than on a small one.

are three means of measuring the magnitude of a ısiness. One is the area of land utilized, another is ıunt of working capital employed, and the third is ıunt of productive labor the farm furnishes. These ctors are not independent of each other. In general, er the area of productive land the greater the working

capital and the amount of productive labor, but this is not always the case. Data are not available for determining the independent influence of these three means of measuring the magnitude of the business, but we have many data which tend to show that each is closely correlated with profit.

In the following paragraphs use is made of the terms "farm income" and "labor income." By "farm income" is meant the difference between receipts and expenses. The farm income must pay interest on the investment and wages to the farmer; hence, farm income is usually divided into capital income and labor income.

AREA OF IMPROVED LAND.

The table which follows shows certain facts developed in a farm survey conducted by the Office of Farm Management in the States of Indiana, Illinois, and Iowa. In all, about 700 farms were included in this survey. Of these farms 273 were operated by their owners and a somewhat smaller number by tenants. The remainder were operated by small landowners who rented additional land, a very common practice in that section of the country. The data in the following table relate to the 273 farms operated by their owners.

Relation of size of farm to farm income.

Number of farms.	Size limits.	Average size.	Farm income.	Number of farms.	Size limits.	Average size.	Farm income.
		Acres.				*Acres.*	
32......	0 to 40 acres....	37.4	$416	31......	160 to 200 acres..	179.1	$1,956
51......	40 to 80 acres...	72.9	848	36......	200 to 280 acres..	239.8	2,738
48......	80 to 120 acres...	106.9	998	19......	280 to 400 acres..	321.8	2,838
44......	120 to 160 acres..	149.4	1,468	12......	400 to 1,250 acres	623.8	6,182

Here it is seen that the farm income increases quite regularly with the size of the farm. Similar results are given in Table 27, page 414, of Cornell Agricultural Experiment Station Bulletin 295, for a farm-management survey conducted in the State of New York.

This is quite generally true where the type of organization is similar on the various farms compared, but a small farm may be so organized as to provide a large business. Hence, the area of improved land is not the only means of measuring

the magnitude of the farm business, but it is important to remember that the smaller the farm the more difficult it is to organize it in such a way as to give a large amount of productive labor and good seasonal distribution of that labor. It therefore requires greater ability to make a preeminent success on a small farm than it does on a farm of considerable size. On the other hand, it requires more ability to make a success on a very large farm than on a medium-sized farm. In all of our farm-management surveys we find, where a large number of farms are studied, that both the largest losses and largest profits occur on the largest farms, but on the average the larger the farm the greater the profit.

The farm-management survey above referred to, conducted in the States of Indiana, Illinois, and Iowa, brought out the interesting fact that the size of the farm is more closely related to the labor income on tenant farms than it is on farms operated by their owners. Thus it happened that 26 of the farms conducted by owners were 80-acre farms, while 25 were 160-acre farms. The average labor income on the 160-acre farms was only 37 per cent greater than on the 80-acre farms. In the same survey 28 of the tenant farms were 80-acre farms and 37 were 160-acre farms. The average labor income on the 160-acre tenant farms was 105 per cent greater than on the 80-acre tenant farms. The reason for this stricter proportionality between the size of the tenant farm and the labor income than between the size of the owned farm and the labor income is not far to seek. The tenant has very little capital, and his family, therefore, must live principally on the labor income obtained. There is consequently a spur to the greatest possible endeavor. But on farms conducted by their owners, the farm family, in addition to the labor income, has the interest on the investment. They can, therefore, live quite comfortably without such strenuous effort as is required on the part of a tenant whose capital is small.

WORKING CAPITAL.

The amount of working capital required on a given farm depends both on the size of the farm and on the type of its organization. In general, the larger the working capital the larger the profits, provided the system of organization is

good. The following table gives a comparison of the working capital and labor income on the 247 tenant farms studied in the farm survey referred to above.

Relation of working capital to labor income on 247 tenant farms.

Number of farms.	Size groups.	Average capital.	Labor income.
5	Capital below $500	$324	$328
21	Capital $500 to $1,000	799	338
44	Capital $1,000 to $1,500	1,271	502
48	Capital $1,500 to $2,000	1,758	655
66	Capital $2,000 to $3,000	2,439	915
41	Capital $3,000 to $4,000	3,415	1,095
14	Capital $4,000 to $6,000	4,808	1,796
8	Capital over $6,000	8,658	2,819

All of the tenant's capital is working capital, and on these farms the tenants furnished practically all of this capital. The labor income mounts rapidly with increase in working capital. It is to be regretted that the number of farms in this survey is not sufficiently large to enable us to determine the relation between working capital and labor income on farms of the same size. Part of the increase in labor income shown in the foregoing table is undoubtedly due to increase in the size of the farm.

AMOUNT OF PRODUCTIVE LABOR.

Since the values created in the operation of a farm are the results of the application of labor, it is not surprising to find that the greater the amount of productive labor a farm furnishes the greater is the profit in farming. In a survey conducted by Mr. G. P. Scoville, county agent for Chemung County, N. Y., the amount of productive labor furnished by a considerable number of farms was compared with their labor incomes, as shown in the following table. The first group of farms furnished an average of 278 days of productive labor annually, giving an average labor income of $279, or almost exactly $1 a day. Another group furnished an average of 406 days of productive labor, returning a labor income of $574, or $1.41 a day. A third group furnished 678 days of labor, giving a labor income of $1,037, or $1.53 a day. Thus, not only does labor income increase with the

mount of productive labor provided by the farm, but it ncreases at a considerably higher rate, so that the greater he amount of labor the greater the profit per day's labor. This is to be explained presumably on the basis that the armer who has the ability so to organize his farm as to give maximum amount of productive labor also has the ability o make that labor more effective than in the case of the verage farmer.

Relation of labor income to amount of productive labor.

Number of farms.	Labor.	Labor income.	
		For year.	Per day.
5	278 days	$279	$1.00
8	406 days	574	1.41
3	678 days	1,037	1.53

ORGANIZATION.

Reference has already been made to the fact that the type f organization may be such as to require a large amount of working capital and provide a large amount of productive abor even on a small farm. It may bunch the labor at cerain periods of the year, leaving other periods comparaively idle, or it may distribute the labor evenly throughout he seasons. On many farms no regular type of organization xists, and the actual management of the live stock and field rops varies greatly from season to season because of the exigencies of the new situations which are continually arising n a farm which is run without any definite plan. In some easons a farmer will have more of some particular crop than is available force can cultivate properly. He will thus slight he work. In other seasons he may have less of the crop han he could manage. Under these circumstances he is pt to put more labor on the crop than conditions justify.

The economy and adequacy of equipment on the farm also have much to do with the possibility of profit. Definite data re not available for determining the exact relation between ll the organization factors here mentioned and profit in arming, but such data as are available will be given.

DIVERSITY.

Especially when farms are small, diversity of enterprises is an important factor in providing productive labor and in distributing this labor to advantage throughout the season. The table following gives comparisons between the degree of diversity and the labor income:

Relation of diversity of enterprises to labor income.

Chemung County, N. Y., survey.			Michigan survey.			
Number of farms.	Degree of diversity.	Labor income.	Number of farms.	Diversity index.	Average area.	Labor income.
					Acres.	
24	Poor	$147	27	2 to 3	93	[illegible]
18	Medium	534	46	3 to 4	94	[illegible]
22	Excellent	1,031	32	4 to 5	97	436
			29	Over 5	93	702

The results given in the first half of the foregoing table were obtained in the survey already mentioned in Chemung County, N. Y., while those in the second half were obtained in a farm-management survey conducted by the Office of Farm Management in southern Michigan. In Chemung County, N. Y., 24 poorly organized farms gave an average labor income of $147. Eighteen farms having moderately good organization produced an average labor income of $534, while 22 well-organized farms gave an average labor income of $1,031. In the Michigan survey the degree of diversity is given in terms of the diversity index. A farm for which the diversity index is 4 has a diversity of enterprises equivalent to four equal enterprises. Of the farms studied in this survey, the diversity index is from less than 2 to more than 5. In general, it is seen that the labor income increases with diversity. It happens, however, that there were two farms in this survey with a diversity index less than 2 but with very high labor incomes.

There are two conditions which may make farming very profitable, at least at times, without diversity of enterprises. One of these conditions arises when in any community a particular farm enterprise is for any reason exceedingly profitable. As long as this condition lasts the greatest profit may be made by sticking to this one enterprise, even if it leaves

he farmer and his working force idle for a considerable por-ion of the year. But conditions of this kind are nearly lways temporary and in most cases decidedly short lived, o that such farming is usually unsafe. The other condi-ion under which farming may be quite profitable without liversity of enterprises is that under which a single farm nterprise permits the use of large power units and gives ood seasonal distribution of labor. This is the case with vheat culture as conducted in the Pacific northwest. The tual income a family can secure on a proper-sized farm ith this system of farming is large, but on account of the arge acreage required it is necessary that the land be cheap, n order that there may be a labor income in addition to an ncome on the capital. Such a single-crop system of farming also exposed to the danger which inheres in any farm usiness based on a single enterprise, namely, fluctuation in rice and danger from loss because of untimely weather onditions. Diversified farming is, therefore, safer than arming based on a very small number of enterprises, and nder most conditions is more profitable. It usually gives nore productive labor than nondiversified systems, and by roperly choosing the enterprises and regulating their mag-itude it can be made to give an excellent seasonal distribu-ion of labor, thus permitting the farmer and his family to lo a larger proportion of the labor with a minimum of horse-ower and other equipment.

SYSTEM IN OPERATION.

There is an utter lack of system in the management of arm enterprises on many farms. Too little attention has een given to standardizing systems of management of enter-rises for different localities. In tabulating the number and ind of operations performed, say, upon the corn crop on lifferent farms, and especially in different localities, one is truck by the enormous variations in practice. The ques-ion arises whether there is any fundamental basis other than ustom for these variations. The subject is one which de-erves investigation.

While the Office of Farm Management has many data on his subject, these data are not sufficient to justify conclu-ions and will therefore not be given here, except merely to llustrate the fact that notable variations of the kind in uestion do exist, even on neighboring farms.

Hours of man labor per acre of cultivated land on three neighboring farms of similar type.

Farm.	Crop index.	Crop area.	Crop labor.	Labor on stock.	Marketing.	Miscellaneous.	Total man hours.
		Acres.					
A	0.82	106	19	8.3	1.0	7	35
B	1.08	130	24	11.3	2.1	13	51
C	.82	35	26	28.6	3.4	32	91

The foregoing table shows certain data concerning three neighboring farms in a Middle Western State. The sizes of the farms are shown in the third column. The relative crop yields are shown in the second column under the heading "Crop index." It is seen that farms A and C have the same average yields, while farm B has yields one-fourth greater. Farmer C does more work than is necessary. Farmer A evidently does less, while farmer B, who gets excellent results, probably devotes about the proper amount of labor to his various enterprises. It is seen that the number of hours of man labor per acre of all crops varies from 19 on farm A to 26 on farm C. A more marked difference, however, occurs in the number of hours of labor devoted to live stock, which varies from 8.3 for each acre of cropped land on farm A to 28.6 on farm C. The same general difference appears in all the divisions of farm labor. Farmer C spends more time on his crops and very much more on his live stock, although he has less live stock per acre than farmer B, and more time in marketing his produce than either of the others. But it is in miscellaneous work that farmer C shows to least advantage. He is able to find 32 hours of miscellaneous work, for most of which he gets nothing, for every acre of crops he produces. In all, he does 91 hours of farm work for every acre of his crops, while farmer A works only 35 and farmer B only 51 hours. Part of these differences is due to the fact that farmer C has a very small farm, but B has a larger farm than A. The point is that the adoption of systematic methods in conducting farm work and the establishing of standard systems of management of enterprises would help to eliminate unnecessary operations and greatly increase the efficiency of farm labor.

ADAPTABILITY OF ENTERPRISES.

One of the most important factors in determining profit in farming is the adaptability of enterprises to soil and climatic conditions, and especially to existing economic conditions. Adaptability to soil and climatic conditions is so obvious as to need only mention here, but the facts regarding adaptability to economic conditions are not so well understood.

The table on page 102 gives an estimate of the average labor income for one of the leading dairy counties in the State of Wisconsin and one of the leading dairy counties in the State of Massachusetts. The calculations are based on census figures in so far as these are available. The estimated cost of maintenance of buildings, implements and machinery, taxes, and miscellaneous expenses are based on the results of farm-management surveys and other investigations conducted by the Office of Farm Management. Unfortunately, certain items necessary to determine accurately the labor income are missing. For this reason the labor income referred to in this table has a different meaning from that referred to in previous tables. In this table the labor income represents not the wages of the farmer but the wages of the whole farm family. Furthermore, in the previous tables the farm family has, in addition to the labor income and the interest on the investment, such supplies as the farm furnishes toward the family living, while in the table under discussion the labor income includes what the farm furnishes toward the family living, except the milk and cream consumed on the farm where it is produced, the last census having made no estimate of the value of this item. In addition, a good many farm families, especially in Massachusetts, earn considerable amounts by outside employment, and on many farms this is the principal source of income. Unfortunately, also, the census gives no information as to the amount of money spent in the purchase of live stock, so that the labor income as given on page 102 must be reduced by the average amount spent annually in the purchase of live stock. To sum up, the labor incomes, together with the interest on the investment, which make up the farm income, require the following modification in order to represent the sum available annually for the family living: The farm income should be increased by the amount of milk and cream consumed on

the farm where it is produced and by the amount earned by the farm family from other sources than the farm, including, of course, interest on investments other than in the farm, and it should be reduced by the amount paid for live stock bought. The figures are therefore not of much value except as a comparison between different regions, for the same defects inhere in the estimates for the two regions.

Estimate of the average labor incomes for farms in a leading dairy county in Wisconsin and one in Massachusetts.

Items of comparison.	Selected county in—	
	Wisconsin.	Massachusetts.
Number of farms	3,356	5,436
Improved land per farm ... acres	65.0	34.2
Number of cows per farm	12.7	5.02
Improved land per cow ... acres	5.38	4.80
Total farm investment	$10,300	$7,945
Value of farm buildings	2,279	3,282
Value of implements and machinery	368	405
Dairy products, per cow	42	106
VALUE OF PRODUCTS.		
Dairy products (exclusive of home-used milk and cream)	$505	$532
Wool and mohair	1	0
Poultry products	124	183
Domestic animals sold	318	175
Domestic animals slaughtered	42	20
Value of crops not fed	576	885
Total	1,566	1,795
EXPENSES.		
Labor	$146	$527
Fertilizers	1	74
Feed	44	396
Maintenance of buildings, 4.5 per cent	102	148
Maintenance of implements, etc., 20 per cent	74	81
Taxes, 0.6 per cent	62	48
Total (designated expenses)	429	1,274
Miscellaneous expenses	64	191
Total (all expenses)	493	1,465
Farm income[1]	$1,073	$330
Interest on investment, 5 per cent	575	397
Labor income[1]	558	−67

[1] Should be increased by the value of home-used milk and cream and receipts from outside sources. Should be decreased by the amount paid for live stock purchased.

It is seen that in the Wisconsin county the average labor income, as above determined, is $558 per annum and the average farm income is $1,073 per annum. In the Massachusetts county, the average labor income is minus $67. In other words, the average farm income is $67 less than 5 per cent interest on the average investment per farm. The reasons for this difference are seen in the data given in the table on page 102. In the first place the western farms are twice as large as the eastern farms, but the average investment in farm buildings is nearly 50 per cent larger on the eastern farms. The investment in farm machinery is also considerably larger on the small farms of the East. In the matter of gross income the eastern farms have distinctly the advantage. Although the average number of cows per farm in the Massachusetts county is less than half of what it is in the Wisconsin county and the income per cow is 2½ times as much, the great difference in expenses in the two counties more than counterbalances this increased income. The Massachusetts county has on the average a higher income per farm from dairy products. It also has a 50 per cent greater income from crops. The trouble lies in the higher expense of farming in the East. The labor bill on the Massachusetts farm is $527 annually, while on the Wisconsin farm it is only $146. The Massachusetts farmer's children have gone to the city and he must hire his labor; the Wisconsin farmer's family does most of the labor. The farmer in the Massachusetts county spends an average of $74 a year for fertilizers, the one in Wisconsin about $1 annually. The Massachusetts farmer buys practically all of his concentrated feed and perhaps some roughage; the Wisconsin farmer raises most of the feed on his own farm, his farm being large enough to justify this course. The total expenses of the average farm in the Massachusetts county are nearly a thousand dollars greater than in the Wisconsin county, while the total income is only about $200 greater.

In order that farming in this Massachusetts county shall be as profitable as in the Wisconsin county, it is necessary, on account of the very much higher expense of farming in the East as compared with the West, that the farm business be based largely on enterprises which have a distinct economic advantage over similar enterprises in the West. It is not yet possible to state in full just what these enterprises are, but some illustrations can be given. The production of hay in

the New England States is less than sufficient to supply the local demand. A considerable proportion of the supply must, therefore, come from the middle West. As hay is a cheap, bulky product, transportation charges on this commodity are relatively high. This gives the eastern farmer a much higher price than his western competitor. Hay production, therefore, appears to be one of the enterprises which possess marked economic advantages in New England. The production of vegetables is another enterprise which enjoys marked economic advantages when conducted in the immediate vicinity of the consumer. This, then, also appears to be an enterprise which should be developed in New England to as full an extent as economic conditions justify.

Those who are most familiar with conditions of production and marketing in New England are of the opinion that the larger cities of that section are supplied with home-grown vegetable products during the summer months in a quantity approximately equal to the demand, but there are many smaller towns and cities, as well as considerable areas of farming community, in which this supply is inadequate. There is room, therefore, for considerable extension of vegetable farming throughout a large part of this territory.

It is undoubtedly true that if the system of distribution of perishable farm products were so perfected as to render it possible to supply all communities at all times of the year with perishable farm products in such quantity as they would use, there would be a very considerable increase in the consumption of this class of farm produce. In view of the competition with the Middle West, where the production of ordinary farm crops and live stock is much less expensive than in New England, such organization for the distribution of perishable farm produce is of prime importance in this region as a means of increasing the possibilities of production of a class of products to which the region is eminently adapted and for which it possesses important economic advantages in nearness to the consumer and in the fresh condition in which products of this class could be laid before the consumer.

Fruit growing appears to be another industry which might well be developed to much larger proportions in New England. Not all of the region is adapted to this industry, but there are localities here and there which can produce various kinds of fruits to advantage. On account of the nearness to

market and the considerable expense of shipping fruit long distances, the New England producer, having an unlimited market near at hand, ought to be able to make a profit from this industry.

In the case of dairy products, prices are based quite generally on the butter value of milk. Because butter can be shipped at very small cost from the middle West to eastern cities, the prices of dairy products in the East and West are not greatly different; but the cost of production, as we have seen, differs very materially. If the dairy industry is to survive in New England it is therefore necessary that it should be confined to those phases of dairying in which the price of the product is not necessarily based on the butter value of the milk. Not only that, but dealers and the public generally must recognize the necessity for paying higher prices for milk in eastern cities. The fact that dairy cows give some occupation during the long winter season in New England is a mitigating circumstance and is one of the reasons why dairying persists under such disadvantageous conditions. Even if the farmer does not earn ordinary wages for the work he does in his dairy in the winter, it is frequently the case that the time thus employed would otherwise be largely wasted, so that any profit he makes over the actual expenditures in conducting this business is so much added to the annual income. The fact remains, however, that economic conditions in New England are unfavorable to the dairy industry. Many other illustrations could be given of economic advantages enjoyed by certain enterprises in particular localities, but this is sufficient to show the importance of the subject.

QUALITY OF THE BUSINESS.

The quality of the business of the farm is indicated by the yield per acre, income per cow, etc. In the Chemung County, N. Y., survey 12 farms having cows two-thirds as good as the average gave a labor income of $255; 12 farms having average cows produced an average labor income of $484; and 14 farms having cows 1½ times as good as the average produced a labor income of $1,175. The quality of the cows kept is therefore a very important factor in the profit. It is more important than the yield of crops, for the following reasons: (1) If the cows are not profitable, no matter how large the yield of crops on dairy farms, the labor

income must be small, or even a minus quantity; and (2) a large income per cow may be obtained by having good cows, while it can not be obtained by the better feeding and care of cows incapable of high production. Thus, if the cows are poor, greatly increased expense for feed and care will not give a corresponding increase in profit, but if the cows are naturally good the profits will be greater with average feeding and care than if the cows are naturally poor.

In the same survey 22 farms having crop yields of two-thirds of the average gave an average labor income of $364; 17 farms with average yields gave a labor income of $712; while 24 farms having yields 1½ times the average gave a labor income of only $653. Up to a certain point the labor income increases even more rapidly than the yield, but beyond that point it decreases. While the farmer can change poor cows for good ones, and thus increase his profits, he can not in general change a poor acre for a good one. In order to secure increased yields, therefore, he must increase the labor and manure applied per acre. This will increase profits within certain limits, but beyond that increased expense will not be rewarded by a corresponding increase in yields. The yield of crops therefore is a less important factor in determining profit in farming than is the character of the cows kept. This is further illustrated in the Michigan survey mentioned. Of 295 farms conducted by their owners, 156 yielded below the average and produced an average labor income of $304, and 139 produced yields above the average, with a labor income of $675. But the 30 farms which produced the highest yields had labor incomes of only $660. Again, in this same survey, 42 farms having a labor income of over $1,000 had yields 12.6 per cent above the average of the whole group of farms, but of these the 30 having the highest labor income produced yields only 10 per cent above the average of the whole group.

COMBINATION OF FACTORS.

In the Chemung County survey the four factors considered were (1) days of productive labor, (2) diversity of enterprises, (3) receipts per cow, and (4) yield per acre. Thirty farms having none or only one of these factors as good or better than the average produced a labor income of

$243; 11 farms having two factors as good or better than the average had labor incomes of $542; 11 farms with three factors as good or better than the average had labor incomes of $818; and 11 farms having all four factors as good or better than the average had an average labor income of $1,230. Thus, when several of the factors of efficiency are present the labor income mounts rapidly.

In this article no attempt has been made to deal with all the possible factors that affect the labor income, attention having been confined mainly to a few of those for which data are available. The Office of Farm Management is attempting to evaluate all of these factors, and it is hoped that the results of its investigations will ultimately give a much better understanding of the problems relating to the farmer's income.

SUMMARY.

We have thus seen that the following are factors of efficiency in farming:

The magnitude of the business, whether measured by area of land farmed, amount of working capital employed, or the number of days of productive labor provided.

Organization, which determines the degree of diversity of enterprises on the farm which may be made to provide full occupation to the available labor and equipment while avoiding the necessity of hiring large amounts of extra labor.

System of management: It is shown that neighboring farmers, with similar types of farming, devote very different amounts of time to the various classes of enterprises on their farms because of the lack of standard systems of management of these enterprises, and it is not always the man who devotes the most time to an enterprise who makes the largest profits from it. Lack of system means lost motion and useless work.

Adaptability of enterprises: In order that the farm may be profitable the crops and live stock maintained upon it must be adapted not only to local conditions of soil and climate but also to existing economic conditions.

Quality of the business: The income per animal unit is a very important factor in profit. Yield per acre is also important, but less so than the income per animal unit. Moderate yields may be more profitable than very high yields.

On a farm which combines a large number of these factors of efficiency, profits are greater than on those which are efficient in fewer things.

Many other factors of efficiency exist, but they are not here dealt with for lack of sufficient data.

THE FARMER.

In the last analysis the farmer himself is the determining factor in every successful agricultural enterprise. It must not be overlooked that the farmer is just as quick to take advantage of economic principles as he is of improved methods of growing crops and feeding animals. In fact, the farmer's experience and training have been fully as great in applied economics as in agronomy and animal husbandry. He will as quickly see the advantages of good farm organization when these are pointed out to him as he will those of improved methods of seed selection, tillage, or feeding.

Experience has shown that the problems of farm organization are usually those of readjustment and improvement of existing systems rather than the introduction of wholly new systems. In most cases it is found that a redistribution of activities or an improvement in methods, which can be effected by the farmer himself as soon as they are brought to his attention, will result in providing a system of operation and an equipment adequate to give maximum results and a minimum expenditure both of money and of effort.

PROMISING NEW FRUITS.

By WILLIAM A. TAYLOR, *Chief of Bureau*, and H. P. GOULD, *Pomologist in Charge of Fruit-Production Investigations, Bureau of Plant Industry.*

INTRODUCTION.

THE conditions under which fruit is grown and marketed are slowly though constantly changing. Standards of excellence in different particulars are being raised. Consumers are gradually acquiring a better knowledge of what constitutes good fruit. Too many varieties are poor in some particular, though perhaps possessing much merit in all other important respects. Practically no varieties are altogether good.

A variety may be productive, an excellent shipping fruit, and attractive in appearance, but poor in flavor; another may have every desirable quality except productiveness; or a variety well-nigh perfect in other respects is very susceptible to some disease difficult to control. But there is no inherent incompatibility in the various characteristics of fruits to prevent the existence of the ideally perfect variety for a particular purpose—the one without fault for its season of ripening.

Consciously or otherwise, the search for the ideal in fruit varieties goes on. Each year sees new varieties brought to light and introduced to the trade. A few of these persist and in time become important in the fruit industry, but the great majority are never widely known, because in reality they do not meet any special need. A new variety in order to attain enduring importance in the fruit industry must represent a high standard of excellence in all particulars, and in at least one particular it must surpass in some region or regions other sorts already in cultivation. And as a rule its merits must even then be persistently and extensively advertised; else its dissemination will be very slow.

It is exceedingly difficult for a new variety, even of the highest merit, to crowd out a mediocre variety that has been extensively planted by many fruit growers. For this reason a variety may be old, as measured by the age of a man, before it becomes generally known. The Stayman Winesap apple, for instance, originated nearly half a century ago,

and for many years it has been known in several sections among fruit growers, but it is only during the last 12 or 15 years that its real value has become widely appreciated.

The fruits to which attention is directed in this paper are varieties which, though admittedly falling short of perfection, are believed to possess valuable characteristics which render them worthy of the attention of fruit growers in the districts to which by experience they may be found to be adapted.

It should be stated that the Department of Agriculture has no stock of these varieties for distribution.

BANANA APPLE.

Synonyms: *Flory, Flory Banana, Winter Banana.*

[PLATE VII.]

EARLY HISTORY.

About the year 1873 or 1874 the late David Flory, sr., planted at his homestead, which was located 5 miles east of Logansport and 1 mile south of Adamsboro, Cass County, Ind., 50 apple trees which he had grown from seed for the purpose of having a few stocks on which to graft desirable varieties. The next year, when grafting the trees, he noticed that one of them showed a marked difference from the others in the fine, thrifty growth it had made. Mr. Flory was impressed with its promising appearance and decided to retain it until it should bear fruit.[1] Accordingly the tree was left ungrafted. It came into bearing quite young, producing fruit which was so pleasing to its owner that he named the apple, calling it "Flory Banana."

In 1890 this variety was introduced to the trade by the Greening Nursery Co. under the name "Winter Banana."[2] This name is reduced to Banana to bring it into harmony with the code of nomenclature of the American Pomological Society. The original tree is still standing and in fair condition; the branches on one side are reported to show some decay as a result of injudicious pruning. It bore a good crop of apples in 1913.[1]

DESCRIPTION.

Form roundish to roundish conic, slightly angular, sometimes slightly oblate; size large; cavity regular, rather large, moderately deep, slope gradual, sometimes slightly russeted; stem medium in size and length;

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[1] Letter from D. M. Flory, November, 1913.

[2] Letter from the Greening Nursery Co., November, 1913.

basin regular, medium in size, variable in depth from shallow to deep, depending upon the region where grown, slope gradual, slightly furrowed; calyx segments medium, converging; eye large, open or partially closed; surface smooth with a rather waxen appearance; color greenish yellow with blush of light red, deepening to rose on exposed side, sometimes covering a considerable portion of the surface; dots on surface few, irregular, medium in size, color brownish, but many whitish dots rather large in size showing indistinctly beneath the surface of the skin; skin medium thick, tenacious, bloom very slight, bluish; flesh yellowish; texture medium fine, tender, breaking, moderately juicy; core conical, clasping, large, open; seeds plump, large, brown, numerous; flavor mild subacid, slightly aromatic; quality good to very good; season winter.

The tree grows well in both the nursery and the orchard; comes into bearing quite young; is prolific under reasonably favorable conditions, and hardy—according to the originator enduring winter conditions in 1885 which destroyed most other varieties.[1]

Since its introduction this variety has been quite widely disseminated, especially in Ohio, in Indiana, in Michigan, and to a limited extent in Iowa. It has been planted rather extensively in some of the apple districts of the Pacific Northwest. As a commercial variety it appears to be growing in popularity in the northern and northwestern apple districts.

The specimen illustrated in Plate VII was grown in 1913 by Mr. C. H. Whittum, Eaton Rapids, Eaton County, Mich.

McCROSKEY APPLE.

[Plate VIII.]

EARLY HISTORY.

The McCroskey apple originated from seed of either a Winesap or a Limbertwig apple which was planted about 25 years ago by the late H. M. McCroskey at his place near Glenloch, about 6 miles east of Sweetwater, Monroe County, Tenn. The exact year is uncertain, but the tree bore its first crop of fruit in 1895.[2]

The name "McCroskey," in honor of the originator, was suggested early in 1896 by Prof. R. L. Watts, then horticulturist of the Tennessee Agricultural Experiment Station,[3] and under that name the variety was described and illustrated

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[1] Letter from the Greening Nursery Co., November, 1913.
[2] Letter from H. M. McCroskey, July, 1898.
[3] Letter from Prof. Watts, February, 1896.

by him.[1] From the resemblance of the fruit to the Winesap apple, it seems probable that it is a seedling of that well-known sort rather than of Limbertwig—a possibility suggested by Mr. McCroskey, as above stated. Prof. Watts regarded it as the most valuable new seedling winter apple of Tennessee origin that had been brought to his attention, its main points of merit being "productiveness, vigor in growth, symmetry and beauty of fruit, and good quality."[2]

According to the originator, the fruit of this variety that fell from the tree kept better than Winesap, Ben Davis, or Limbertwig apples that were hand picked.[3] Prof. Watts reports the receipt of well-preserved specimens as late as May 1.

DESCRIPTION.

Form conical; size medium; cavity regular, medium in size and depth, slope abrupt, with small russeted area about stem; stem about one-half inch in length, slender; basin regular, medium in size and depth, slope rather abrupt, slightly furrowed in some specimens, with slight leather cracking about apex; calyx lobes medium in size, reflexed; eye closed or slightly open; surface smooth; color greenish yellow, entirely overspread in well-colored specimens with rather dark red and indistinctly marked with darker stripes; dots small, rather numerous, not conspicuous, yellowish white in color; skin moderately tough and tenacious; flesh yellowish; texture moderately fine grained, fairly juicy; core conic, clasping, small to medium in size, open; calyx tube small, funnel form, open nearly to core; seeds medium size, plump, reddish brown, 6 to 8 in number, rarely more; flavor subacid, rather rich, pleasant, very good: season winter.

This apple has not been widely disseminated, but to the extent to which it has been grown in Tennessee it appears to be a very promising sort.

It is interesting to note in the present connection that there are a number of seedlings of the Winesap apple which have assumed considerable commercial importance. The most prominent one which is an authentic seedling of this variety is Stayman Winesap.[4] Magnate [5] is valuable in some sections. Arkansas, Paragon, Arkansas Black, and Kinnard are other varieties disclosing evidence of Winesap parentage

[1] Apples of Tennessee Origin, Tennessee Agricultural Experiment Station Bulletin, vol. 9, No. 1 (May, 1896), p. 18.

[2] Tennessee Experiment Station Bulletin, vol. 9, No. 1, p. 19.

[3] Letter from Mr. McCroskey, July, 1898.

[4] For illustration and description, see Yearbook U. S. Department of Agriculture for 1902, p. 470.

[5] For illustration and description, see Yearbook U. S. Department of Agriculture for 1906, p. 355.

ett.

BANANA APPLE.

PLATE VIII

newton

McCROSKEY APPLE

Fon

OPALESCENT APPLE

E. I. Schutt

LIZZIE PEACH

each of which has gained considerable prominence in some districts. Moreover, several unnamed apples of evident value reported to be seedlings of the Winesap and which resemble it in many respects have been called to the attention of this department. It therefore seems probable that a rather high percentage of Winesap seedlings possess more than the ordinary merit. The usefulness of that variety for breeding purposes is thus indicated.

The specimen of McCroskey apple illustrated in Plate VIII was grown in 1912 by Mr. L. C. H. Ayres, of Midway, Green County, Tenn.

OPALESCENT APPLE.

Synonyms: *Hudson's Pride of Michigan, Hastings.*

[PLATE IX.]

EARLY HISTORY.

The Opalescent apple originated with Mr. George M. Hudson, Shultz, Barry County, Mich. The circumstances of its origin as given by him are as follows:[1]

> A number of years ago I was digging out the oak stumps in my orchard and found a thick cluster of sprouts by the side of one. I picked out the best sprout and set it out, intending to top-graft it, but you will see the result.

At the same time, specimens of the fruit were submitted to the department by the originator under the name "Hudson's Pride of Michigan," with the request that a suitable name be given to the variety. Accordingly "Hastings," the township in which the variety originated, was suggested as an appropriate name. In due course this was approved by Mr. Hudson, and the name was published by the American Pomological Society.[2] But prior to such publication, this variety had been disseminated by the Dayton Star Nurseries,[3] of Dayton, Ohio, under the name "Opalescent."[4] The original tree was still standing and in fairly good condition in 1912.[5]

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1 Letter from Mr. Hudson, December, 1896.

2 Proceedings, 25th session, American Pomological Society, 1897, p. 38, 1898.

3 Letter from J. W. McNary, receiver, Dayton Star Nurseries, February, 1899.

4 Historical and descriptive notes concerning this variety have been published comparatively recently as follows: Varieties of fruit originated in Michigan, Michigan Agricultural Experiment Station, Special Bulletin 44, p. 18; New or noteworthy fruits, New York Agricultural Experiment Station, Bulletin 364, p. 181.

5 Letter from George W. Thomas, December, 1913.

DESCRIPTION.

Form roundish; size large; cavity regular, large, deep, slope gradual with russet markings; stem moderately long, slender; basin regular, size and depth medium, slope abrupt, slightly furrowed in some specimens, sometimes slightly russeted and leather cracked; calyx segments small to medium, converging; eye medium, open or partially open; surface smooth; color yellow, washed over nearly entire surface with mixed red and indistinct stripes and splashes of dark crimson, sometimes an overspread of gray; dots rather conspicuous, yellowish, many indented; skin medium thick, tenacious, light bluish bloom; flesh yellowish, sometimes slightly tinged with red near the skin; texture medium coarse, tender, moderately juicy; core roundish or roundish conic, clasping, size medium, open; seeds plump, medium in size, brown, numerous; flavor mild subacid; quality good to very good; season late fall and early winter.

The tree has been reported to be somewhat subject to blight, but otherwise to be healthy and vigorous.

The Opalescent apple is not extensively grown at the present time, but it has been quite widely disseminated in the northern apple districts since it was introduced 12 or 13 years ago. Because of its attractive appearance and fairly good quality, together with other desirable characteristics, it is worthy of being thoroughly tested for a late fall and early winter apple generally in the northern apple regions.

The specimen illustrated in Plate IX was grown in 1913 by the New York Experiment Station, Geneva, Ontario County, N. Y.

LIZZIE PEACH.

[PLATE X.]

EARLY HISTORY.

The history of the Lizzie peach is identical with that of several promising varieties that have been developed in recent years with a view to meeting a distinct need and as the result of a well-directed personal effort toward a particular end.

The Carman[1] peach, probably a chance cross of the Elberta and Family Favorite, originated from a seed of the former variety that was planted in 1889 by Mr. J. W. Stubenrauch of Mexia, Limestone County, Tex. The Carman was the forerunner of a considerable number of varieties that Mr. Stubenrauch has originated since that variety appeared. From the first fruiting of the Carman in 1892, it gave promise of unusual value. This early promise has

[1] For illustration and description, see Yearbook U. S. Department of Agriculture for 1901, p. 385.

been fulfilled in a marked degree as the years since its introduction have passed.

As Mr. Stubenrauch observed the behavior of the Carman, he began to consider means whereby nature could be assisted in producing other varieties that would be better for his region. He had previously planted quite heavily of the Elberta peach. Among the trees of this variety he had observed that a particular one was remarkable in comparison with the others because of its more thrifty growth, its greater productiveness, and the superior quality of the fruit. Having a block of the Mamie Ross peach which was isolated from other varieties, some of the best trees of it were partially "budded over" with buds taken from the Elberta tree just referred to. In the same manner, selected trees of the Bell October peach—a fine, late, yellow freestone variety of high quality, ripening with the Salway—were top-worked with buds of the same Elberta tree that was used in budding the Mamie Ross trees.

As the Elberta buds top-worked into the Mamie Ross and Bell October trees grew and came into fruiting, the plan followed was to select the best specimens of fruit on the Elberta limbs as they ripened and to save the seeds from them, care being taken to keep those from the Mamie Ross trees separate from those borne on the Bell October trees. These were planted the following winter, which was that of 1901–2. The trees which came from these seeds made an excellent growth the next season and were transplanted from the nursery into orchard rows.

All of these trees which did not begin bearing earlier came into fruiting the third and fourth years from the planting of the seeds. They were systematically studied by Mr. Stubenrauch, and at the end of the fifth season a considerable number were discarded and dug up, as they gave no promise of value. Selections continued to be made for several years, or until it became possible to choose from the collection a series of varieties of merit that produce fruit continually in the region of their origin from about July 15 to October 1, or a period of approximately two and one-half months.

The varieties which constitute this series have a firm flesh and stand shipping remarkably well. One of the aims of the originator has been to secure varieties that could be shipped successfully for a distance of 150 to 200 miles by fast

freight or express without the use of ice, thus making it possible readily to supply the smaller markets located comparatively near points of production, which are frequently without peaches, while the larger and more central markets are often glutted. Moreover, the most of these varieties appear to be especially hardy while in blossom. They are reported to have borne a good crop of fruit in a number of seasons when several degrees of frost occurred during the blossoming period and completely destroyed the blossoms of most of the standard sorts. In general, the trees are thrifty. The fruit is as large as or larger than the Elberta when grown under the same conditions and of good dessert quality in favorable seasons. Names have been given during the last two or three years to the more important selections made by Mr. Stubenrauch. These include the Lizzie, which has been chosen from among this collection of varieties for illustration and description in the present connection. It originated from one of the seeds selected from an Elberta limb on a Bell October tree, and accordingly it may be a natural cross between these varieties. Its characteristics give considerable weight to this supposition.[1]

DESCRIPTION.

Form globular to obovate, sides sometimes unequal; size medium to large; cavity regular, medium, rather deep, slope abrupt; suture shallow except at cavity, extending beyond the apex; apex a small tip; surface slightly irregular; color rich yellow with light reddish blush tending to stripe on exposed side; down very short and sparse; skin moderately thick and tough; flesh rich yellow, red at pit; texture firm, meaty, moderately juicy; stone broad, obovate, pointed at tip, free, large; flavor rich, vinous, nearly sweet; quality good to very good; season latter part of August or about two weeks after Elberta at place of origin.

The tree makes a good, thrifty growth and is reported to be intermediate in habit between the Elberta and the Bell October. It is productive, usually requiring heavy thinning in favorable seasons. The leaf glands are slightly reniform, many nearly globose. The fruit is reported to be quite highly resistant to brown-rot. The variety is considered worthy of being extensively tested, especially in the peach-growing districts of the Southern and Southwestern States.

The specimen shown in Plate X was grown in 1913 by Mr. J. W. Stubenrauch, of Mexia, Limestone County, Tex

[1] Information supplied by Mr. Stubenrauch in various communications to this department.

FLOWERS GRAPE.

[PLATE XI.]

That the fruit industry of the United States has been built up largely with fruits which represent introduced species is a fact which presents itself at times with almost startling force and significance. This, however, is less true of grapes than of the other important fruits.

While the Vinifera grape industry represents an investment of many millions of dollars, the cultivation of this class of grapes is largely restricted to the territory west of the Rocky Mountains, including California. The grapes which are extensively grown elsewhere throughout the country, with few exceptions, belong to native species of Vitis. The Muscadine grapes, which include the native species *Vitis rotundifolia* and *Vitis munsoniana*, are becoming increasingly important in the South Atlantic and Gulf Coast States.

In view of the present interest in the culture of these grapes in many parts of the region to which they are adapted, and the systematic attention that is now being given to the investigation of them and the breeding of more desirable varieties, it may be expected that the culture of these grapes will eventually contribute very materially to the horticultural development of the South.

Unlike most other fruits, the Muscadine grape has thus far developed but few important varieties; in fact, a single variety, the Scuppernong, is of such great importance in comparison with the others that it might almost be referred to as constituting the commercial Muscadine industry. There are, however, at least six varieties of considerable importance, with a still larger number that have been named and more or less disseminated, but which thus far are chiefly of local value.

The two varieties shown in Plate XI are among the six most important sorts.

EARLY HISTORY.[1]

The original vine of the Flowers grape was discovered in 1819 by "Popping Billy" Flowers, growing in a swamp 15 miles south of Lumberton, Robeson County, N. C., and was

[1] History and description condensed from notes published by George C. Husmann and Charles Dearing, The Muscadine Grapes, Bureau of Plant Industry, Bulletin No. 273.

transplanted by him to a location a few hundred yards distant. It has since been grown quite extensively for home use in the region of its origin. It is the oldest named black variety of *Vitis rotundifolia* in cultivation.

DESCRIPTION.

Cluster nearly round, fairly compact; large for the species, composed generally of 6 to 10 berries; berries slightly oval, medium size, purplish black, dots only faintly visible; skin very thick and tough; flesh whitish, meaty, tough, not very juicy; seeds usually 3 to 4, more angular than other varieties and adhering tenaciously to the pulp; flavor sweetish, lacking in sprightliness; quality medium; season late, from about October 15 until destroyed by frost.

The vine has an upright, slender growth and is more open and hardly as vigorous as other varieties of the same species. The leaves are thick, rather dark green in color, leathery, cordate, with sharp-pointed tip and sharply serrated margin.

The distinguishing characteristics of the Flowers are its tendency to bunch, coarseness and meatiness of flesh, thickness of skin, late season of ripening, good shipping qualities due to strong adherence of berries to peduncles, and productiveness. In these respects this variety is well distinguished from other sorts. It is used mostly for making wine, though the product is not considered as good as that from the other important Muscadine varieties.

It appears to be especially well adapted to sandy-loam soils having a relatively high elevation, and it is reported to do well in such locations from North Carolina southward as far as the Florida Keys.

The cluster illustrated in Plate XI was grown in 1910 at the Pender Test Farm of the North Carolina Department of Agriculture, Willard, Pender County, N. C.

JAMES GRAPE.[1]

[PLATE XI.]

EARLY HISTORY.

The first vine of the James variety was found growing, about 1866 or 1867, by Mr. B. M. W. James, near Grindool Creek, a short distance from the post office then known as Grindool, Pitt County, N. C., but now called Whitehurst, about 3 miles south of Parmele.

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[1] History and description condensed from notes published by George C. Husmann and Charles Dearing, The Muscadine Grapes, Bureau of Plant Industry, Bulletin No. 273.

When discovered, the vine was only a few inches long, but it bore a cluster of grapes composed of 9 or 10 berries which were unusually large and which remained on the vine in good condition for a long time. These characteristics attracted Mr. James's attention, and he transplanted it to his home grounds, a short distance away. This vine is still growing and covers an arbor about 20 feet in diameter.

DESCRIPTION.

Cluster nearly round, fairly compact; large for the species, but because of the size of the berries rather than their number; berries usually 4 to 6 to the cluster, but ranging from 2 to 12 or even more, round, large, rather glossy, bluish or deep purplish black when fully ripe, with few but conspicuous "guinea-egg" specks. Before reaching full maturity there is a characteristic reddish coloring about the peduncle; flesh firm, meaty, juicy; skin thick, rather tough; seeds typical of the species, but larger than those of other leading varieties, adhering rather strongly to pulp; flavor sweetish but rather flat, berries ripening in the shade being much better than those which ripen in the sun; quality medium; season about October 1.

The vine is vigorous and productive, and it readily adapts itself to systematic training on upright forms of trellises. The leaf is cordate in form with serrate margin. In late summer a portion of the space between the prominent veins turns yellow some time before the portions immediately bordering them lose their green color, thus producing an effect which is quite characteristic of the variety.

The James is not much grown outside of North Carolina, though it appears to do well as far south as Florida.

The attractive appearance of the fruit, its juiciness, fair quality, and good adherence to the peduncle combine to make the James one of the best Rotundifolia varieties for general purposes in the regions to which it is adapted.

The cluster illustrated in Plate XI was grown in 1910 at the Pender Test Farm, Willard, Pender County, N. C.

TRIUMPH PERSIMMON.

[PLATE XII.]

EARLY HISTORY.

In the late seventies or early eighties the late Gen. H. S. Sanford procured some imported Japanese persimmon trees for planting at his place near Sanford, Fla. The budded or grafted top of one of these trees proved to be dead, but the stock below the point of union was alive. It was rejected

by the owner, but carried home and planted by one of his employees, a Mr. Ludbury. In due course a sprout grew from the roots, and from it a tree was budded for Mr. H. L. DeForest. The original tree died shortly after this, but apparently the one propagated for Mr. DeForest lived and became the source from which the variety, now much grown in some parts of Florida, was propagated.

Very early in the history of the variety, following the successful growing of the tree on Mr. DeForest's place, about 15 wilding trees, which came up in the orange grove on the homestead of Mrs. O. Kennedy, were budded to this variety. This place was located a short distance north of Sorrento and about 11 miles east of Eustis, Fla.

This variety was first commercially propagated some time prior to 1887 by the late G. H. Norton, then the proprietor of a nursery at Eustis, and by him it was named "Triumph."

It is reported that in 1887 Mr. DeForest shipped 5 boxes of this variety to Boston, where they sold for $5 per box.[1]

DESCRIPTION.

Form distinctly oblate, in cross-section indistinctly quadrangular; size small to medium; cavity regular, large, medium depth, slope very gradual; stem short, about one-half inch, slender; apex a small point set in a very small, shallow basin which is surrounded, in some specimens at least, by an indistinct quadrangular shield of gray; calyx large, 4 lobed, reflexed; surface smooth except for rather indistinct sutures which divide the fruit into quarters, the suture lines in many specimens encircling or nearly encircling the fruit and radiating from the corners of the 4-parted calyx; color bright yellowish red to dark orange red, depending upon stage of maturity; dots numerous, very minute, appearing indistinctly beneath the skin, hardly visible in some specimens; skin very thin, tender; bloom very light, whitish; flesh yellowish red at outer edge, losing yellowish shade as fruit softens, with numerous yellowish fibers through the flesh, these becoming indistinct as the fruit softens, translucent; texture buttery, tender, moderately juicy; core oblong, cylindrical, medium in size, closed; seeds very variable, many specimens seedless, sometimes 5 to 8 in number, plump or consisting merely of the unfilled integument, small to medium in size, rich brown in color, condition and number of seeds probably determined by extent of fertilization; flavor rich, sweet, somewhat astringent before ripening, but losing astringency upon softening; quality very good. Season in vicinity of Glen St. Mary usually begins in September and continues until toward the last of November, but the bulk of the fruit ripens the last week in October and the first half of November; when the weather is not too cold some specimens may hang on the trees until nearly Christmas.

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[1] Letter from G. H. Norton, October, 1887.

FLOWERS AND JAMES GRAPES

SACKETT & WILHELMS CO N Y

E. I. Schutt.

TRIUMPH PERSIMMON

ctt

LUE ORANGE

E. I. Schutt

BOONE CHESTNUT

The tree presents a very attractive appearance and holds its leaves later than most varieties of the Japanese type. Its growth even in the nursery row is very characteristic, and it is one of the few varieties that can readily be distinguished from the trees of other sorts. This is by reason of its peculiar bark and the pink color of the petioles when the leaves are young.[1] Some of the trees on the Kennedy homestead at 4 years of age were estimated to bear 1,500 fruits.[2] Heavy bearing has continuously characterized the variety. It is a variety highly prized, especially for home use. Almost every landowner in the vicinity of Eustis has from one to a dozen trees of it.[3] The skin is so thin and tender that it may be less desirable for shipping, except when marketed in a rather immature state.

The specimen illustrated in Plate XII was grown in 1913 by the Glen St. Mary Nurseries Co., Glen St. Mary, Baker County, Fla.

LUE ORANGE.

Synonym: *Lue Gim Gong.*

[PLATE XIII.]

EARLY HISTORY.

The history of the Lue orange as published by the American Pomological Society [4] is substantially as follows:

> In 1888, Mr. Lue Gim Gong, of De Land, Fla., pollinated the Hart (*Hart's Late*) with pollen of what was believed to be a Mediterranean (*Mediterranean Sweet*) orange. A single fruit containing 15 to 18 seeds resulted from this effort. From these seeds about 12 trees were grown, no two of which proved to be alike. One tree, when it came into bearing, produced fruit which appeared to be so superior to the Hart, which is the standard late orange in Florida, that Mr. Lue budded one side of each of 45 trees to it. Buds of the Hart (*Hart's Late*) orange were put into the other side of 15 of these trees, while several different sorts were budded into the other side of the remaining trees.

This variety was introduced to the trade in 1912 by the Glen St. Mary Nurseries Co., under the name "Lue Gim Gong" in honor to the originator. This name is reduced to Lue in conformity with the code of nomenclature of the American Pomological Society.

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[1] Letter from H. Harold Hume, November, 1913.
[2] Letter from G. H. Norton, October, 1887.
[3] Letter from Frank W. Savage, December, 1913.
[4] Proceedings, American Pomological Society, 1911, p. 172.

DESCRIPTION.

Form roundish; large; cavity very small, shallow, somewhat furrowed; stem slender; apex a small tip in a very shallow basin; surface slightly undulating with indented dots; color rich orange yellow; oil cells numerous; rind relatively smooth, adherence medium, rather thin and tender; segments 10 to 12, fairly regular in size; flesh pale orange, tender; cells large, irregular, enveloping tissue thin; core nearly solid, filled with white pith; juice translucent, abundant; seeds plump, medium in size, straw color, few in number; flavor slightly subacid, pleasant; quality very good; season begins in July, but is mainly during August and September in Florida.

The tree is said to be hardier than most standard varieties. It makes a thrifty growth and is very productive. The fruit is said to hang to the tree well during the rainy season in Florida, which usually begins in June and lasts several weeks. The fruit ripens during a period when about the only oranges in the market are Valencias from California. It is remarkably heavy, does not lose moisture rapidly, and possesses excellent shipping and keeping qualities.

Its early promise of exceptional value has been fully realized as the older trees have come into bearing. It is considered of special importance as a late variety in the orange districts of Florida and worthy of careful test in other orange districts.

The specimen illustrated in Plate XIII was supplied in 1911 by the Glen St. Mary Nurseries Co., Glen St. Mary, Baker County, Fla.

BOONE CHESTNUT.

Synonym: *Daniel Boone.*

[PLATE XIV.]

EARLY HISTORY.

The Boone chestnut originated with the late George W. Endicott, of Villa Ridge, Pulaski County, Ill., and is a seedling of the Giant (*Japan Giant*) pollinated with an American chestnut. According to the originator, it took him seven years to find a tree of the latter which blossomed early enough to furnish pollen with which to pollinate the Giant. After finding one, he pollinated 20 blossoms of the Japanese variety in 1895. From this work he obtained 14 nuts. These were stored in moist sand during the following winter, and on April 1, 1896, they were planted.

All germinated, but with the exception of two trees they made a feeble growth and gave promise of no value. The two more vigorous trees made a growth of about 3½ feet during the first season. One of these—the variety now under consideration—ripened six burs of nuts early in September of the following year; that is, the second year from seed.[1] The name by which the variety is known was applied by Mr. Endicott in 1902 after he became impressed with its value and was given in memory of that early American pioneer, Daniel Boone. He began propagating it about the same time for his own use, but it was introduced to the trade by Mr. E. A. Riehl, of Alton, Madison County, Ill. The name, appearing as "Daniel Boone," was published first in the Transactions of the Illinois State Horticultural Society for 1906.[2]

DESCRIPTION.

Burs large, color rather dark green; spines short, stiff, dense, several times branched on peduncles one-eighth to one-fourth inch long; nuts large, 55 to 62 per pound when fresh; usually 1 to 4 nuts to the bur, occasionally as many as 6; color rich brown, pubescent only at tip; shell of medium thickness; inner husk rather thick, quite pubescent; flavor sweet; quality good to very good, comparing favorably with the best of the Japanese varieties; season about September.

The tree is thrifty and vigorous, with a symmetrical, roundish head. In August, 1913, the original tree measured 38 inches in circumference at breast height and was estimated to have a height of 25 feet and a spread of limb of more than 30 feet. The foliage is dense and rich green in color; the leaflets average about 6 inches in length and are deeply serrated. The tree usually blossoms about June 5 and matures its crop before September 20, about 30 days earlier than the native American chestnuts growing in the same locality.

This variety is apparently strongly self-fertile and in this respect is unlike most chestnut trees. For the first three or four years after it came into bearing and while it was somewhat isolated from other trees, seedlings of it which were grown by Mr. Endicott came nearly "true to the variety," but later other trees standing near it began to blossom; following this the seedlings of Boone varied greatly.

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[1] Letters from George W. Endicott, October and November, 1913.

[2] Transactions of the Illinois State Horticultural Society for the year 1906, vol. 40 (1906), p. 219.

The early bearing of the original Boone tree has been mentioned. It has continued to bear with remarkable constancy and regularity. With only one important exception, which was in 1910 when injured by a very late frost, the crop has been larger each year than it was in the preceding one. The bearing record of this tree as furnished by Mr. Endicott [1] is as follows:

Bearing record of the original Boone chestnut tree at Villa Ridge, Ill.

Year.	Pounds.	Year.	Pounds.	Year.	Pounds.	Year.	Pounds.	Year.	Pounds.	Year.	Pounds.
1897	[1] 6	1900	5	1903	12	1906	31	1909	56	1912	78
1898	1	1901	6	1904	17	1907	43	1910	[2] 5	1913	140
1899	3	1902	8	1905	23	1908	50	1911	80		

[1] Burs. [2] Frost in June.

The crop of 1913 was sold at 30 cents per pound, giving a gross return for the one tree of $42. But, obviously, such a large return is exceptional and not a safe basis for estimates of "average returns" for entire orchards.

The bur of nuts illustrated in Plate XIV was grown in 1913 by the late George W. Endicott, Villa Ridge, Pulaski County, Ill.

[1] Letter from Mr. Endicott, October, 1913.

HEALTH LAWS.

By Francis G. Caffey,

Solicitor, U. S. Department of Agriculture.

In the early history of the United States little legislative attention was given to health conservation. When necessity for public action was first generally recognized, it was almost universally regarded as the business of the States. But, along with the growth of population, the multiplication of complexities of civilization, the development of transportation, the quickening of communication, and the increase of governmental activity in other matters directly affecting the lives of individuals, there has gradually come into existence a mass of Federal legislation on the subject. To-day each of the ten executive departments of the United States Government is engaged, directly or indirectly, in the administration of one or more acts of Congress designed to safeguard health.

The original statute of 1862 establishing the Department of Agriculture defined its chief purpose to be the acquisition and diffusion among the people of the United States of useful information on subjects connected with agriculture, in the most general and comprehensive sense of that word. While this definition is still retained in the organic law, concurrently with the spread of its other activities the department has had imposed upon it many duties that concern health primarily and agriculture only incidentally. The principal of these relate to foods, drugs, and meats.

The food and drugs act and the meat inspection act were approved the same day, June 30, 1906. Both were the outgrowth of statutes which had proved insufficient. Both, probably, are mere forerunners of more effective legislation which experience will demonstrate to be essential; in the last seven and a half years the food and drugs act has been twice amended and the provisions of the meat inspection act have been extended to imported meats. Both operate within the District of Columbia, the Territories, and other places

under the jurisdiction of the United States. Both deal with interstate and foreign commerce. Their main domestic concern is necessarily confined to interstate transactions and imports, inasmuch as the District of Columbia, the Territories, and the insular possessions comprise a relatively small proportion of our population. A fair conception of their limitations is gained by considering that in our forty-eight States all foods, drugs, and meats which are produced, manufactured, handled, and sold intrastate, which never enter interstate or foreign commerce, may be kept beyond the pale of Federal law.

FOOD AND DRUGS ACT.

The purpose of the food and drugs act is twofold. Primarily, it is intended to enforce honest labeling of the foods we eat and the drugs we take. Secondarily, it is intended to conserve health in so far as it is affected by these articles. The act, therefore, makes unlawful the misbranding and adulteration of the foods and drugs with which it deals.

Each of the terms "food," "drug," "misbranded," and "adulterated" is specifically defined in the act. In some respects the definitions are broader, and in other respects more restrictive, than the meanings given in common parlance. Wherever any of these words is used in connection with the act it is to be taken solely in its statutory sense.

"Food," within the act, includes "all articles used for food, drink, confectionery, or condiment by man or other animals." "Drug," as used in the act, includes "all medicines and preparations recognized in the United States Pharmacopœia or National Formulary for internal or external use, and any substance or mixture of substances intended to be used for the cure, mitigation, or prevention of disease of either man or other animals."

All "misbranding" and much statutory "adulteration" are capable of correction by the use of appropriate names and labels. The prohibitions against improper nomenclature and marking are of immense commercial importance to manufacturers, dealers, and consumers; they tend to prevent cheating and to compel fair dealing. Their value in that aspect is great and should not be underestimated. They are also important to consumers as aids in avoiding the

purchase or use of articles without knowing what they are; but the "misbranding" and a large proportion of the "adulteration" provisions of the food and drugs act have no other direct bearing on health.

It is unfortunate that the general public has not yet appreciated that the act is principally a labeling and not a health law.

The statute takes cognizance of two classes of adulterated foods. In one class whether an article is adulterated depends on the name or the label under which it is sold. Change of name or label so as correctly to describe the product will relieve it from the charge of adulteration, which could otherwise be maintained against it, because of false or misleading representation as to its identity, quality, or strength. Adulteration of the second class is inherent in articles themselves, irrespective of names or labels, and incapable of being cured by naming or labeling. The more important provisions of the act affecting products of this class declare adulterated those foods which consist, in whole or in part, of a filthy, decomposed, or putrid substance, or contain any part of an animal unfit for food, or contain any added poisonous or other added deleterious ingredient which may render the articles injurious to health. It is further provided that confectionery shall be deemed adulterated if it contain any of certain specified substances or any poisonous or deleterious ingredient, whether added or not.

Whether a drug is adulterated depends solely on the labeling or the name under which it is sold. Falling below the professed standard of strength, quality, or purity is an adulteration, but declaration on the label of the actual strength, quality, or purity of an article, notwithstanding that it differs in these respects from the standard laid down in the United States Pharmacopœia or National Formulary, removes the article from the ban of the statute. The food and drugs act contains no provision as to drugs prohibiting adulteration in any popular sense of that word. The forms of "adulteration" of drugs which are prohibited may all be cured by correct labeling.

In addition to the general advantage to consumers resulting from the prohibition of untruthful labels, an important protection against the misuse of certain habit-forming drugs

is afforded by a special requirement that the quantity or proportion of drugs of that class, when present in any article subject to the act, shall be stated on the label.

It is a criminal offense to manufacture, sell, or offer for sale any adulterated or misbranded food or drug within the District of Columbia or within the Territories, including the insular possessions of the United States; to ship or deliver for shipment any such article from any State or Territory or the District of Columbia to any other State or Territory or the District of Columbia or to a foreign country; or to receive and deliver or offer to deliver in original unbroken packages any such article brought from another State or Territory or the District of Columbia or a foreign country.

The penalty for a first offense under the clause regulating manufacturing is a fine not to exceed $500, or imprisonment for one year, or both, and for a second offense, a fine of not less than $1,000, or imprisonment for one year, or both. The penalty for a first offense under any other clause is a fine of not exceeding $200, and for each subsequent offense, a fine of not exceeding $300, or imprisonment for not more than one year, or both. In addition, under libel proceedings in the Federal courts, adulterated or misbranded articles held for sale in the District of Columbia, the Territories, or insular possessions, or in the course of interstate or foreign transportation, or remaining after interstate or foreign transportation unloaded, unsold, or in original unbroken packages, may be seized and, when condemned by the court, may be destroyed.

The Department of Agriculture administers the act through the Bureau of Chemistry. Samples are collected, investigations conducted, and hearings held by that bureau. A compliance with department decisions is secured in large measure without resort to the courts. Apparent violations of the law are reported to the Department of Justice by the Department of Agriculture when the facts seem to warrant prosecutions or seizures. In addition, United States attorneys are required, when satisfactory evidence is furnished, to prosecute violations of the act reported to them by health, food, or drug officials of the States, the District of Columbia, and the Territories. The conduct of all litigations, civil and criminal, is in the hands of the Department of Justice. The statute makes it the duty of the Department of Agriculture

to publish notices of the judgments of the courts. The publicity given by means of these notices is a powerful aid toward securing compliance with administrative rulings and deterring the commission of offenses.

The importation of foreign and the export of domestic foods and drugs are also regulated by the act. In the investigation of imported products, the Treasury Department cooperates with the Department of Agriculture.

MEAT INSPECTION ACT.

The meat inspection act, though similar in intent to the food and drugs act, is primarily a health and secondarily a labeling law. Its purposes are accomplished by different means and are capable of more nearly certain attainment. Inspection of meats derived from cattle, sheep, swine, and goats, prior to entry into interstate or foreign commerce, is mandatory, except in the cases of retail butchers and retail dealers supplying their customers and of animals slaughtered by farmers on the farm. Under the food and drugs act the sole powers are to penalize persons who and to seize articles which violate the law. Carriers are not prohibited from transporting adulterated or misbranded foods or drugs. The meat inspection act not only prescribes punishments for producers, shippers, and dealers guilty of offenses under its provisions, but prohibits carriers from transporting for interstate or foreign commerce meats derived from any of the four classes of animals named in the act which do not bear marks of Federal inspection and approval. It is estimated that approximately sixty per cent of all meats and meat food products in the United States derived from cattle, sheep, swine, and goats are under Federal inspection. It is obvious that but a small percentage of the foods and drugs transported in interstate or foreign commerce could be subjected to Government inspection and marking without an appropriation many times the $3,200,000 a year required for meat inspection.

The meat inspection act provides for the maintenance by the Department of Agriculture of a system of inspection of establishments in the United States in which cattle, sheep, swine, or goats are slaughtered or the carcasses or meat or meat food products of which are prepared for interstate or

foreign commerce. If, on such inspection, the articles are found to be wholesome, within the meaning of the act, it is the duty of department inspectors to mark them "inspected and passed," and, if not, to mark them "inspected and condemned."

All such establishments are required to apply to the Department of Agriculture for inspection and to maintain sanitary conditions in the conduct of their business. No meats or meat food products are permitted to be brought into federally inspected establishments unless derived from animals which have had both ante-mortem inspection and post-mortem inspection at the time of slaughter, except farm-slaughtered animals, with the heads and certain viscera attached, which must be inspected at the time of admission. Inspection may be withdrawn from establishments which violate the law or the regulations prescribed by the department. The withdrawal of Federal inspection from an establishment is tantamount to a prohibition against its longer engaging in interstate or foreign commerce in articles with which the act deals.

Transportation in interstate or foreign commerce of any meat or meat food product derived from cattle, sheep, swine, or goats not bearing the mark of Federal inspection and approval is an offense, punishable by a fine of not more than $10,000, or imprisonment for not more than two years, or both. The sale or offer for sale or transportation for interstate or foreign commerce of any diseased, unsound, unhealthful, or unwholesome meat or meat food product, or of such an article which is otherwise unfit for food, with knowledge that the same is intended for human consumption, is punishable by a fine of not exceeding $1,000, or by imprisonment for not exceeding one year, or both.

In addition, all meats and meat food products entering interstate or foreign commerce, or manufactured or sold in the District of Columbia or in the Territories, are subject to the provisions of the food and drugs act. While the meat inspection act does not provide authority to seize such articles outside of federally inspected establishments, the power of seizure conferred by the food and drugs act is applicable to them.

The meat inspection act exempts from its inspection requirements animals slaughtered by farmers on the farm and retail butchers and retail dealers in meats and meat food products supplying their customers, but provides that if any of these persons ships his product in interstate or foreign commerce, knowing that it is intended for human consumption, and it be unfit for food, he is guilty of a violation of the law.

As originally enacted in 1906, the meat inspection act did not deal with imported meats; they were subject only to the food and drugs act. By the tariff act of October 3, 1913, the importation of meats was made conditional upon their being wholesome and free from unwholesome substances and complying with regulations of the Secretary of Agriculture. To ascertain wholesomeness, the Secretary of Agriculture investigates foreign systems of meat inspection and causes the meats themselves to be inspected at ports of entry before admission into the United States. Importations are prohibited from countries which do not maintain systems of inspection as efficient as our own, and articles found upon inspection at ports of entry to be unwholesome or to contain unwholesome substances must be refused admission into the United States. After admission, with marks of Federal inspection and approval, such imported products may be carried into federally inspected establishments and must be otherwise treated as domestic articles which have been inspected and passed.

The Department of Agriculture administers the meat inspection act through the Bureau of Animal Industry. Most of the results are accomplished without litigation. Where prosecutions are necessary, they are conducted by the Department of Justice, upon reports of the Department of Agriculture, in the same way as proceedings under the food and drugs act.

The proportion of the foods, drugs, and meats consumed by the people of the United States, which of necessity must enter interstate commerce and are, therefore, subject to the food and drugs act or the meat inspection act, or both, is, and always will be, large. The problem of efficient administration is enormous, difficult, and expensive. Full com-

prehension by the people of precisely what these statutes are would greatly lessen the burden of officials charged with the duty of enforcing them.

OTHER HEALTH LAWS ADMINISTERED BY DEPARTMENT OF AGRICULTURE.

While the laws dealing with foods, drugs, and meats are of chief importance, other laws affecting health, with the administration of which the Department of Agriculture is charged, are also important.

The so-called twenty-eight-hour law prohibits the confinement in railroad cars and boats of animals in course of interstate transit for a period longer than twenty-eight hours without being unloaded, for feed, water, and rest, for five hours, except that, upon proper written request in advance by the owner or person in custody of the shipment, the period of confinement may be extended to thirty-six hours; provided that carriers may relieve themselves of the duty of unloading by supplying ample facilities for feed, water, and rest on board their cars or boats. The intention of this statute is humane, but it tends to bring animals to slaughter markets in more fit condition.

Three acts of Congress prohibit the interstate shipment of live stock affected with contagious, infectious, or communicable disease, or coming from areas quarantined by the Secretary of Agriculture for such disease. Another act prohibits importation of neat cattle, sheep and other ruminants, and swine which are diseased or infected with disease or which have been exposed to infection within sixty days previous. A recent act regulates the importation and interstate shipment of viruses, serums, and toxins for the treatment of domestic animals. Under appropriation acts the department is engaged in campaigns against hog cholera and other animal diseases, obviously alike in the interest of human health and of preventing waste. The department is also charged with the inspection of dairy products intended for export, with the inspection of process or renovated butter, with the sanitary inspection of renovated butter factories, with the conduct of investigations for the determination of the nutritive value of foods, and, in connection with the Forest

Service, with the administration of national forest areas affecting the water supplies of certain municipalities. Much more of the department work which is primarily directed toward increasing economic efficiency incidentally affects the health of farmers and the wholesomeness of all kinds of agricultural products.

NEED FOR EXERCISE OF POWERS BY THE STATES.

Anomalous as it may seem, the validity of a large proportion of Federal health laws is predicated on the commerce clause of the Constitution. Yet the Supreme Court of the United States has sustained them against all attacks. Whatever may have been the original conception of the relative functions of the States and the Federal Government in respect to health conservation, it can not now be doubted that there is a very large field in which Federal authority is complete and, when exercised, exclusive. The fact is that the statutes already enacted are but a crossing of the threshold of the power which Congress may exercise and, if the public demand it, doubtless will exercise.

On the other hand, there are indisputable limitations upon Congress. Beyond these the Federal Government can not go. There is, and always will be, a large field exclusively for State legislation. If the power of the States be not fully exercised, then the public health, in so far as it is dependent on governmental activity, will remain unprotected.

On the administrative side, the Department of Agriculture for years past has cooperated in many ways with the States in health matters. It is manifestly important that such cooperation should continue; that duplication of effort should be avoided; that Federal and State legislation should be supplementary and consistent; and that State statutes should be uniform.

Experience demonstrates that there is still much popular misconception of the separate domains of Federal and State laws. In order to secure intelligent Federal administration, and to prevent dormant reliance upon lack of necessity for State action, it can not be too strongly emphasized or too frequently recalled that, outside of the territory which is exclusively under the jurisdiction of the United States, the

two chief Federal laws affecting health, which the general public knows about, are operative only upon interstate and foreign commerce in the articles with which those laws deal.

In framing further health legislation Congress may lawfully cover much unexplored ground. The inevitable difficulties to be overcome under the limitations contained in the Federal Constitution can be obviated by complete and uniform exercise of their powers by the States. Wisdom suggests that these difficulties should be avoided in future by appropriate State activity.

It is essential to recognize the respective fields of Congress and the State legislatures in measuring the possible efficiency of present laws and in planning for new laws.

THE AMERICAN THRUSHES VALUABLE BIRD NEIGHBORS.

THE ROBIN, BLUEBIRD, AND OTHER MEMBERS OF THE THRUSH FAMILY ENTERTAIN WITH THEIR SONGS AND HELP THE FARMER BY EATING MANY DANGEROUS PESTS.

Prepared from data furnished by Prof. F. E. L. Beal, *Biological Survey.*

WHEN our English ancestors first came to America they found a bird with a brown back and a red breast that reminded them of the robin redbreast so often alluded to by the British poets, and they proceeded to call the new bird by the old name. The bird, however, was not the same. Our so-called "robin redbreast" is really a thrush, although few of us would think of him as related to the sober brown wood thrush or the distinctive bluebird. The English robin redbreast is actually more like our bluebird than like our robin. The fallacy of the earliest settlers who transferred their affection from the real redbreast to our robin has been largely responsible for the esteem in which we now hold our little American bird neighbor.

The object of this transferred affection, however, is worthy of our kind consideration, as are practically all members of the American thrush family, to which it belongs. This family is one of the most prominent and widely spread of the various bird families in the United States. The birds have retiring habits and their songs are pleasing. Their plumage is modest, indeed, it is almost somber, the blue of the bluebird (most noticeable of the thrushes) being the most brilliant tint displayed by any of the family. The general character of the thrushes' plumage is a brown back with a spotted breast. The robin and the bluebird have red breasts.

Through close association with man and his works, this group of birds have endeared themselves to our rural population and are often protected merely because their presence is enjoyed. In addition, they fulfill a useful function by reducing the insect life constantly preying upon the crops.

A large part of their food, particularly of the young ones, consists of insects. Unless nature provided checks like the thrush family to keep the balance between the insect and the vegetable kingdoms, vegetation would soon be destroyed.

The thrush family is a very large one, and itself is made up of a number of smaller groups or species. These are usually well known to the farmers in the vicinities they frequent. The following are the common names for species of the well-known family of thrushes:

Robin (Pl. XV).
Oregon robin.
Bluebird.
Western bluebird.
Mountain bluebird.
Wood thrush (Frontispiece, upper figure).
Veery.
Gray-cheeked thrush.
Olive-backed thrush.
Hermit thrush (Frontispiece, lower figure).

THE SHYEST MEMBER OF THE FAMILY.

One little member of this family is so seldom noticed that he has no popular name. Scientists call him "Townsend's solitaire." He inhabits mainly inaccessible mountain gorges in the West, subsists largely on wild berries, and so comes into contact with man only infrequently.

ROBIN AND BLUEBIRD ARE MORE DOMESTIC.

In contrast to the "solitaire," the robin and the bluebird are the most domestic of the family. Their songs are among the earliest to announce the coming of spring, as they return to their breeding places in March or early April. The robin is found as far north as Alaska. Generally, however, he is fond of the districts east of the Great Plains, which are more thickly settled by man.

The Oregon robin is a slightly different fellow, being found westward toward the Pacific. Both robins are for the most part migratory in the northern half of this country, but some individuals remain throughout the winter in the north where shelter and food are assured. Cedar swamps where there are many berries are favorite winter resorts for the robin. The robin, and the bluebird also, habitually winter as far north as southern Illinois, and not infrequently the former remains as far north as Massachusetts or southern Michigan, if food is abundant. The robin is probably more familiarly known and has figured in our American literature to a greater extent

ROBIN (PLANESTICUS MIGRATORIUS

than all other birds together. The bluebird has also come in for a larger share of attention than most of the thrushes.

The first of the thrushes to leave for the South in the fall are the wood thrush, the veery, the gray-cheeked, and the olive-backed thrushes. The olive-back usually stays longest in southern climes, and only makes its first appearance in the North in May.

The different species that make up the great thrush family have each developed little peculiarities of their own. These are particularly noticeable in the homes which the different species choose for themselves. The hermit thrush and veery generally build on the ground in thick cover. If possible they choose a locality near running water. Other members of the family usually build upon shrubs or small trees.

THE BLUEBIRD MOST PARTICULAR ABOUT HIS HOME.

The bluebird is the most exclusive in the matter of homes. He usually selects a place completely inclosed, sometimes moving into the cozy hollow of a tree that has been carefully cleaned out by an obliging woodpecker. He will also show partiality for dwellings rigged up by human hands for his special accommodation, as a box or birdhouse placed on a post.

The robin also likes shelter, but does not insist upon being as exclusive as the bluebird. A beam under a shed, a cranny in a wall, a cornice under a gable, or the fork of a tree usually satisfies his more democratic tastes.

THE WOOD THRUSH THE MOST OPERATIC MEMBER.

All the members of the thrush family can sing, but the most operatic of them all is the wood thrush. The wood thrush, however, is so modest that many country people who know his song do not know him by sight. His favorite time for singing is in the early evening or toward the close of a sultry afternoon, when a shower has cooled the air. At such times his song has a peculiar sweetness unlike that of any other bird. The veery and hermit thrush are also good singers.

As is usual among birds, the gayest colored members of this family are the poorest musicians. So it happens that the bluebird and the robin sing less frequently than the more somber-colored thrushes. However, they do sing, and

their notes are listened for in the early spring by country folk, who welcome these earliest heralds of warmer weather and flowers.

THRUSH FAMILY NOT VEGETARIANS.

While all the thrushes like berries and fruit, they are fonder of animal food. They are especially partial to beetles, and these make up about one-fifth of their animal diet. The bluebird members are most addicted to the beetle diet, and as many beetles are very destructive to crops, the farmer feels kindly toward these little bird neighbors that help him out.

Indeed, the diet of such a large and widely distributed group of birds is of more economic importance to man than might at first appear. Thrushes eat many other pests besides the beetle. They also eat certain fruits and berries of value to the farmer. It is, therefore, important to find out just how many destructive and how many valuable things thrushes eat in order to determine whether these birds should be discouraged or encouraged. The report of the scientists who have spent considerable time on the problem has been in favor of the thrushes.

The fruit raiser as well as the farmer may well be interested in knowing exactly what is the ordinary food of the thrushes. According to the scientists their diet is quite varied. Some idea of it may be obtained from the following menu which the average thrush would enjoy, although he would hardly sample all the items at one meal.

A THRUSH MENU.

Spiders. Snails. Grasshoppers.
Ants. Angle worms.

BEETLES.

(Choice varying according to thrush.)

Potato beetle. Plum curculio. Clover-leaf weevil.
May beetle. Corn weevil. Spotted squash beetle.
Alfalfa weevil.

CATERPILLARS.

Army worm. "Cutworm." Yellow bear.
Codling moth. Yellow-necked appleworm. Cabbage worm.

BUGS.

Chinch bug. Black olive scale. Seventeen year locust.

FRUITS AND BERRIES.

Apples. Grapes. Raspberries.
Apricots. Currants. Strawberries.
Cherries. Blackberries. Figs.

WILD BERRIES.

Dogwood. Poison ivy.
Mountain ash. Virginia creeper.
Choke berry. Holly.

WEED SEEDS. WATER.

ECONOMIC SIGNIFICANCE OF THE THRUSH MENU.

By examining the above list one may see that the thrushes destroy many dangerous pests. The newly imported alfalfa weevil, which has committed ravages in the West, has already been selected by robins as a choice article of diet. The May beetle in the above menu is the parent of the well-known white grub and is most destructive to grass.

Ants have an unpleasant habit of fastening their jaws to anything that disturbs them, so the thrushes' fondness for them may be wondered at, though there are other bird families fond of ants. Ants are of very doubtful value to rural communities. Several kinds of ants render service as scavengers, but hundreds of other varieties are very harmful. The so-called ant "cow" is a parasite most harmful to valuable plants. The ants protect these parasites during the entire year and thus aid them in their injurious work. Someone has described the ant as "the little black milkmaid that pastures her cow on a roseleaf."

Practically all caterpillars are harmful, and if it were not for nature's check on their rapid multiplication there would soon be no trees in the land, for their leaves would all be eaten by caterpillars. Thrushes are nearly unanimous in their fondness for this soft, juicy article of diet, and in quantity it makes up about one-tenth of their entire bill of fare.

As for the grasshoppers, they are considered particularly delicious in midsummer, when they are of rather soft texture. They are abundant, easily obtained, and are eaten by the great majority of birds. The thrushes, however, have not

the same fondness for them as for caterpillars. The three bluebirds, which seem to be the biggest eaters, are fondest of them, and one-fifth of their food consists of this insect. Other members of the thrush family eat them only on special occasions. It is hardly necessary to comment on the harm that grasshoppers might do to crops if it were not for birds that prey on them.

The quantity of so-called "bugs" eaten by thrushes is relatively small. However, considering their undesirable quality, it is important to note this item. The chinch bug, in particular, is a most harmful enemy of the wheat crop. The black olive scale and the 17-year locust are most dangerous to fruit and forest trees, and their elimination is to be desired.

Spiders would not seem to be an appetizing food, but are fairly well liked by the thrush. About 4 per cent of the average food of the thrush family is spiders. The wood thrush, veery, and hermit thrush eat about twice the average amount, while the robin very rarely cares for spiders.

The snail naturally falls a prey to the thrush when he seeks out dark, shady nooks for a drink at some spring, and finds this tempting morsel awaiting him. The Oregon robin, however, is the only thrush that is really a snail epicure.

The fruit and berry diet of the American thrush, while it contains certain items relished by human beings, is largely made up of articles that would be very disagreeable, if not dangerous, for human consumption. The reason certain wild berries are found along farm fences, as though especially planted there, is that the original seeds were dropped by birds resting on the fences.

THRUSHES LIKE NOVELTIES IN FRUIT.

Thrushes, like many people, are fond of novelties of diet. They will eat an unusual quantity of something new, and then finally go back to their former diet, leaving the novelty alone. When certain fruits were first introduced in California the birds did so much damage to them that it was thought that the crop would be unprofitable because of them. Several years later, however, the birds settled down and bothered the orchards very little. The same thing happened when grapes were first grown in Texas. The first year the

birds gorged themselves on grapes, but later on they seemed sated with this novelty and caused little appreciable damage.

In general, the thrushes as a group do little injury to the fruit crop. These birds visit swamps and underbrush in preference to orchards and gardens when looking for fruits and berries. In some cases where cities are built up the thrush is compelled to go to orchards for its vegetable diet, as there are no wild berries.

In New Jersey it has been found that if wild berries are planted around cultivated berries the thrushes will show such a preference for the former that they will scarcely touch the latter. Some thrushes also prefer fallen fruit to that still on the trees, even though the latter is better from our point of view. Under ordinary conditions of country life wild fruits are so abundant that thrushes seldom trespass upon cultivated varieties.

Of all the thrushes the popular robin, under exceptional conditions as above described, is the greatest destroyer of fruit. It must be remembered, however, that during the earlier season he steadily works to help make that crop a possibility. When the fruit ripens, the robin has already a standing account with the farmer for services rendered, for he has been eating injurious insects and taking them in the very act of harming the tree.

SCARECROWS RATHER THAN GUNS FOR TROUBLESOME THRUSHES.

When robins are too numerous they may, of course, overdraw their account, but it is sometimes difficult to determine whether they have actually done so. They may not even be condemned for a whole year's showing, because their services to the farmer in several previous years may far more than offset the bad record of one. Also a bird that has done damage to one crop, as for instance cherries, may merely be taking his pay for protecting other crops of greater value.

It must also be borne in mind that birds may be fostered by so much human care and protection that they become so

plentiful that the available supply of insects and wild fruits will not feed them. They are then naturally forced to seek the orchards for sustenance. Under normal conditions nature arranges that when insect and berry supplies are rare the birds decrease in number; when the insect pests become more numerous the number of birds increases.

In any case, when thrushes become troublesome an effective remedy may usually be found. Devices for frightening birds are always better than those for destroying them. Scarecrows will probably frighten the thrushes from the vicinity, and certain fruit-bearing shrubs planted about the dooryard will attract them from the cultivated crops. Destroying the birds will do more harm than good in the long run.

The biologists have encountered much difficulty in determining the thrush menu set forth above. Formerly it was the custom to watch birds and make more or less satisfactory guesses as to what they were eating; now, instead, the stomachs of a sufficient number of birds are examined to enable the investigators to draw general conclusions. In some cases very strange things were found in the stomachs of thrushes. The shell of something that puzzled one investigator proved to be the jaw of a caterpillar. Sometimes an indigestible part of a vegetable would turn up which had not been eaten directly by the thrush, but by an insect which the thrush had eaten in turn. It has taken several years sometimes to determine positively that certain articles of diet are generally eaten by thrushes. The painstaking work of the ornithologists has, however, eventually given us the complete menu which is of such importance in determining the status of this bird family.

On the whole, thrushes make interesting and valuable bird neighbors to our farmers. They are a sociably inclined family, usually selecting by preference places where man has taken up his abode. Their presence and their songs are very generally welcome. Economically they are valuable little neighbors as well.

WHAT THE DEPARTMENT OF AGRICULTURE IS DOING FOR THE HOUSEKEEPER.

By C. F. LANGWORTHY,
Chief of Nutrition Investigations, Office of Experiment Stations.

INTRODUCTION.

THE Department of Agriculture in its varied activities comes very close to the life of the people, not only of those who produce the crops, but also of those who convert the raw materials of agriculture into finished products and of those who use them. Its interests extend to the town as well as to the country and to the home as well as to the farm.

So long as the housekeeper shared in the outdoor activities of the home and helped to produce the commodities she used she combined in herself the functions of producer, inspector, caterer, and user. She then had little need to discuss with others either the nature or the uses of the materials she handled. Her chief need was for technical skill, and this was received directly from her mother and in turn passed on to her daughter without the aid of outside educational agencies. When, however, under new conditions it came about that she bought a large part of the commodities she used, as is now the case even in isolated rural districts, it became necessary for her to express her desires with reference to the characteristics and qualities of the commodities she bought. The result, therefore, of the increasing importance of the home maker as a consumer of the products of agriculture was a new demand on her part—not so much a demand for new commodities as for knowledge and a demand for information which would help the family to meet certain world-old needs. The housekeeper has been asking for information on many home matters. She has sought to learn the effects of cooking upon the nutritive value of foods; she has asked what constituents are needed for an adequate and proper diet for her family and what foods are particularly suited to the needs of children; she has sought to know the comparative strength and wearing quality of various textiles used for clothing and for house furnishings,

and the best methods of cleaning and preserving such textiles; she has sought help in matters connected with household sanitation, such as water supply, plumbing, heating, ventilating, and lighting; she has been aroused to an interest in the problems of efficiency, and is looking for sources of reliable information, not only about the relative value of various kinds of textiles, but also about the comparative amounts of energy required for performing household tasks by different methods.

Housekeepers are also seeking help in conducting those household industries which still remain in the home and which usually fall to the lot of women. They are seeking the best methods not only in cooking, sewing, and housekeeping, but also in poultry raising, flower gardening, market gardening, and beekeeping. In their philanthropic and charitable activities also, which are rapidly taking the form of what is known as "social service," women are recognizing the need for definite kinds of information. They are finding that in helping to solve the many problems which affect the home and community they need to know the cost of living and factors which influence it and to compare expenditures with income. This is true whether they interest themselves in such fields of work outside the home, as membership on the boards of orphan asylums and other public institutions, as managers of boarding clubs and homes for students, and in such enterprises as the serving of luncheons for school children either as a philanthropic measure or for other reasons. They are realizing that it is necessary to have some definite information about such matters as the amount of nourishment which can be bought for a given sum, the wearing quality of textiles, and the relation of housing conditions to health.

Agriculture supplies the bulk of the raw materials used in the home for food, for clothing, and for household equipment. Since the Department of Agriculture gives attention not only to problems of production and distribution, but also to problems of consumption, and since, all things considered, the home is the greatest consumer of the products of farm and garden, it is inevitable that information should be forthcoming from the department which will help to solve many of the housekeeper's problems. The interdependence of agricultural

interests and home problems has also resulted in work in the Department of Agriculture undertaken particularly to meet the housewife's needs and to insure a better utilization of agricultural products in the home. A survey of the work of the department will show that it is not the case, as sometimes claimed, that the National Government bends its energies solely to the study of man's activities and overlooks the housewife and her problems.

GENERAL ACTIVITIES.

Broadly speaking, the Department of Agriculture is concerned with such matters as the production of crops, timber, and flocks and herds, with studies of plant and animal diseases and their control, with the establishment of standards of quality, with the protection of agricultural products from adulteration, with the processes for converting raw products of agriculture into finished products ready for use, with insect enemies and their control, with agricultural engineering problems, with rural economics, with rural life and activities, and with educational problems pertaining to all of these. Information is gathered in the field, in the laboratory, and in other ways, and the results are spread broadcast by means of publications, demonstration work, correspondence, personal contact, and teaching, the last largely through extension work, through the agricultural colleges, and through other organized methods of education.

In answering the questions which arise in the minds of the producers on the farms the investigator almost inevitably furnishes information about the commodities which the housekeepers buy and use and whose composition they should understand. Help for the housekeeper, who directs the spending of the family income, or, as the economist would put it, represents consumption, is, in fact, not only one of the inevitable by-products, but one of the very valuable main products of agricultural research, and is clearly recognized as such by the department.

RELATION OF DIFFERENT BUREAUS TO HOME ACTIVITIES.

It is interesting to consider in some detail some of the ways in which the work of the department contributes to the housekeeper's fund of useful informaton.

Through the Bureau of Animal Industry the department studies the breeding and feeding of farm animals and the questions pertaining thereto. It carries on this work primarily for the purpose of assisting those who depend for their livelihood upon the raising of stock, but the stock is raised in order that we may be supplied with meat, milk, butter and eggs, wool for clothing, and leather for shoes. Improving the production of farm stock means a larger and better supply of these products. This bureau interests itself in the handling of milk, primarily to benefit the dairy business, but the effort for cleaner dairies and more sanitary methods of handling milk benefits all who use this important foodstuff and the products made from it, and enables the housekeeper better to protect her family, and particularly her children, from disease. The Bureau of Animal Industry also investigates the existence of communicable diseases among live stock, studies their nature, causes, and prevention, and takes measures to wipe them out. This obviously benefits the farmer. In this and in its meat-inspection work it also safeguards the home by insuring a wholesome supply of animal products used as food.

The Bureau of Chemistry, among its other activities, has studied the composition of thousands of materials used in the home and many processes for converting the raw materials of agriculture into finished products. One has but to remember its extended studies of sugar, of bread and breadstuffs, of commercial food products, and so on, to realize how closely the results concern the home. The same could be said of its studies of fruits and their preservation, of storage and its relation to quality, and of the extended activities which have resulted in the establishment of food standards and the carrying out of the provisions of the National pure food law. Of great importance are the methods for research which have been developed by this bureau, and here, as in many more lines of its work, it will be found that it has made a very large contribution to the fund of information of use to the housekeeper.

The Bureau of Plant Industry could not labor as it does to increase the yield of crops which are used for food either for man or for live stock, and to protect plants from injurious diseases, without aiding the housekeeper in her efforts to

obtain a good and varied food supply for her family. It could not bring into the United States and domesticate food plants which have proved acceptable in other countries without helping the housekeeper in her efforts to secure pleasing variety in her bills of fare, as well as helping the farmer to profitably extend his activities. A study of farm accounts has also been begun, which includes records of household expenditures. To cite another instance out of many, the girls' home garden and canning club work directly benefits the home and the housekeeper. Designed originally to teach girls how to grow a crop, learn its uses, and preserve a surplus for winter use, the work has extended to methods of canning for market, and not only has started an interest in improved methods of housekeeping in a great number of homes, but has enabled many girls to earn money for further study.

The Bureau of Entomology, through its study of insects and their relation to man, is the housekeeper's best aid in her warfare against flies, mosquitoes, ants, moths, and other insects which carry filth, transmit disease from one home to another, or destroy materials and household equipment.

The Office of Public Roads can not carry on its activities without benefiting the home and the community as well as agricultural interests, for by improving the condition of roads it brings the home into closer communication with market, school, library, church, and social centers.

The Department of Agriculture Library, through its bibliographies and other publications and its close relations with teachers and others who seek information through published data, reaches the student of housekeeping as directly as the student of agriculture.

The Office of Experiment Stations has been studying problems which pertain to agricultural education, and more and more, as the years have passed and information has accumulated, agricultural education has come to include the activities of the home as well as the activities of the farm; so much so that at the present time home economics is included in the curricula of a large proportion of the agricultural colleges. It is worth noting that educational work on these lines is by no means limited to this group of institutions. Indeed, in educational movements of recent years nothing is more marked than the increased attention which is given to the

study of plant and animal life and to home economics. No one realizes more clearly than the teachers of these subjects in secondary schools, normal schools, colleges, and universities and the authors of textbooks intended for their use, how much the Department of Agriculture has contributed to the fundamental data used in the classroom.

Such statements might be extended and instances multiplied of ways in which these and other units of the Department of Agriculture render assistance to the housekeeper, as a result of its efforts to aid in the production, protection, and distribution of agricultural crops and the products made from them, and its related activities.

NUTRITION INVESTIGATIONS AND HOME PROBLEMS.

In addition to such work the department has for more than 20 years carried on work which relates directly to the home and its activities, through the nutrition investigations of the Office of Experiment Stations, undertaken especially to study the utilization in the home of agricultural food products, both animal and vegetable.

Early in the work the composition and nutritive value of the more common American foodstuffs were investigated. Following this work came studies of the kind and amounts of food used by American families of different occupations and incomes, which, with studies of the laws of nutrition, furnished information regarding the kind and amounts of food needed by men, women, and children of different ages and activities, and helped in the formulation of dietary standards which express these needs in definite terms. Many studies have also been made of the thoroughness of digestion of different foodstuffs, and as a result a large fund of information is available regarding the digestibility of a great variety of materials. The changes brought about in animal and vegetable foods by cooking processes have also received attention, and the effect of cooking upon digestibility. An important side of the work has been the development of methods and apparatus, including the bomb calorimeter and the respiration calorimeter, for use in the study of these questions. Information has been collected, classified, and standardized regarding the care of food in the home, home canning

and preserving, and preparing foods for the table. The study of these questions has involved cost considerations and the planning of meals which will adequately meet family needs as well as please the palate, and other similar questions. Incidentally, much information has been gathered regarding household sanitation, household conveniences, and other household problems.

It has been the object to collect facts which would explain household processes and to provide exact data which could be formulated and passed on for practical as well as scientific use. All this work has been designed not to supplant but to supplement empirical, practical knowledge which housekeepers have gained from uncounted years of experience and passed on from mother to daughter.

Such investigations as those enumerated bear the same relation to housekeepers' problems that systematic technical study bears to other industries. Commercial activities were long ago studied by scientific methods, since it had been found that gaining knowledge by experience is much more costly than gaining it by systematic study. Much more recently we have come to realize that it is equally possible to study the housekeeper's problems by laboratory methods. Yet so useful has such work been found, that now the housekeeper consults the investigator as naturally as the manufacturer does the engineering expert. And it is as true as it is in the case of business enterprises that systematic study is needed to furnish the broad foundation on which improvements in household operations should be based.

The results of the nutrition investigations have been published in technical bulletins, some 50 in number, designed for the investigator and the teacher, and in about the same number of Farmers' Bulletins and other popular publications, which summarize the laboratory research and general data gathered from other sources, in a form designed to meet the housekeeper's needs. That this has actually been the case is indicated by the very large demand for these publications from housekeepers, teachers, and others interested in home problems, and by the rapidly growing correspondence between housekeepers and the Department of Agriculture. Just as the farmer turns to the Department

of Agriculture and his experiment station for information, so the housekeeper seeks answers to her problems from the Department of Agriculture.

The Farmers' Bulletins referred to above have covered a great variety of topics, such as the food value of milk, sugar, bread, meats, fruits, vegetables, and eggs; bread and bread making; the economical use of meat in the home; cheese and its economical uses in the diet; mutton and its value in the diet; canned fruits, preserves, and jellies (household methods of preparation); the preparation of vegetables for the table; corn meal and its uses in the diet; kafir corn and cowpeas and ways of using them; and the care of food in the home.

Some of the other popular publications which have appeared have had to do with food customs and diet in American homes, with green vegetables and their value as foodstuffs, and with raisins, figs, and other dried fruits and their uses in the diet.

In connection with information concerning the nature and uses of foods and scientific data about them, recipes are often included for preparing foods for the table. These recipes are gathered from many sources; they are carefully compared and those are selected for study which represent essentially different modes of preparation. Those chosen are modified when necessary and are carefully tested and standardized before they are published.

The demand for technical information has been larger than the supply in most cases. For the popular publications it has been very large indeed, as may be seen from the fact that to date over twelve million of the Farmers' Bulletins on food and nutrition topics have been needed to meet the requests for them from housekeepers, teachers, students, and others, which is an average of more than 1 bulletin for every 10 persons of the ninety-odd millions making up the population of the United States. The demand for circulars and other popular publications on the subject has been correspondingly great.

A publication designed to help the housekeeper as well as the student to understand the relative value of different foods is the series of 15 food and diet charts printed in color and showing in graphic form the composition of the common

food materials and summarizing some fundamental data regarding nutrition and dietary standards. These charts might be called "food maps," since they show, in a simple way, the kind and proportion of nutrients present in common food materials as well as their value as sources of energy for body needs.

The inquiry naturally arises, Can the results of investigations and publications such as those enumerated be used to the housekeeper's advantage, and are they desired? The proof that they are so used is found in the growing interest in the subject, in the increased demand for more work of broader scope, and, most directly of all, in the very numerous letters received from housekeepers and home makers giving their opinions as to the work and its importance. An answer to the first part of the question raised can be given by citing some illustrations of ways in which such data on subjects related to the home have contributed to the solution of home problems, and in the following pages attention is directed to some matters of interest to the housekeeper which are discussed on the basis of results obtained in the department's studies of nutrition.

RESULTS OF EXPERIMENTAL STUDIES AND THEIR RELATION TO PLANNING MEALS.

Perhaps no subject is of more interest to the housekeeper than the preparation of food materials which are palatable as well as adequate and nourishing. It need hardly be said that to be thoroughly satisfactory a diet must do more than furnish sufficient building material and energy to meet the needs of the body. It must also furnish the material in a form in which the body can make use of it without disturbing the digestive organs and must be made up of wholesome materials, well prepared, and must be palatable, in accord with rational dietary habits, and reasonable in cost as compared with available income. Individual food materials differ somewhat in the ease and readiness with which their nutrients can be turned to account in the body, but with healthy persons these differences are less significant than is commonly supposed. Proper preparation is very important, for the illness caused by bad cooking must be very great. Some people imagine that there is no particular advantage in making

a diet attractive beyond the mere gratification of appetite, but physiologists think differently, for scientific research has shown that appetizing diets actually stimulate the action of digestion. Variety in food is a great aid in making meals appetizing and also serves to insure a supply of all the chemical ingredients needed.

To say that a family bill of fare must be appetizing and varied does not necessarily mean that it must be costly as well. At first sight, it might seem difficult to secure these qualities without buying rather expensive materials or serving very fancy dishes, but the theory does not hold in the case of food any more than in that ot clothing and house furnishings. A house furnished without regard to expense and also without intelligence and taste may be a dreary place after all, while one furnished with inexpensive materials, chosen by a person of experience and taste, may be really beautiful. In the same way, meals do not need to be made up of elaborate dishes or delicacies in order to be attractive. Indeed, the staple food materials skillfully combined and simply but attractively prepared are more pleasing in the long run than elaborate living, and more wholesome as well. Just as the test of a woman's ability in dress is to get suitable and attractive effects with relatively low expense, so the test of her catering ability is to give her family an ample supply of wholesome and pleasantly varied meals with an outlay of money and time proportionate to her income and circumstances. There is nothing new in this ideal; good housekeepers have always tried to realize it, and, though they may have been unconscious of its physiological significance, have handed down the tradition of such suitably balanced combinations of food materials from generation to generation. The novelty lies in the fact that science is just catching up with the home makers and is finding the reasons for some of the old beliefs, testing all, that the useful may be retained, adding to the store of useful fact regarding materials and processes, and formulating the results of experience and experiment in such a way that they may be passed on to those who need the knowledge. This has an advantage over tradition only in that it substitutes exact for general data. It also enables the teacher to formulate knowledge so that it may be used in the classroom. Not only may the home maker, if for any reason she has not

learned her art from the older women in her family, correct the deficiency by the study of publications dealing with home-making topics, classes for home study, etc., but, more important still, the young generation, facing as it does new conditions of living, can be grounded in the schools in the principles ıd practices of home making adapted to those conditions.

Variety in the diet can be secured both by providing differ-ɜnt kinds of food and by preparing staple foods in different ays, and the best results are obtained by combining both nethods. When the housekeeper studies the list of common 'oods and the combinations made from them, she will prob-ıly find that as regards their place in the menu they fall into ;wo general groups—those which, like bread, potatoes, milk, ɡgs, etc., have little distinctive taste, and those which, like heese, seasoning vegetables, some sweets, cooked meats, ɜtc., have marked and individual flavor. She will further find that the mild-flavored materials are the ones which are used in the greatest quantities, meal after meal, while those of pronounced taste appear in smaller amounts, or some of them only occasionally. To put it in another way, she will depend largely on the first group to make up the bulk of her dietary, and on the second to vary it. In cookery, some foods require only simple methods to make them very palatable. Tender steaks, or chops, in cooking, develop delicious meat flavors and require no highly flavored vegetable seasoning or condiments to make them palatable. In themselves they furnish flavor sufficient to accompany potatoes, rice, or other foods of mild flavor. On the other hand, in stews and other dishes made from the cheaper cuts of meat, carrots, onions, or other distinctive flavor is usually added to supplement that of the meat flavor, for the cheaper cuts are not usually of such a texture that the best results can be secured by such simple methods as broiling or roasting. Children's preference for bread and butter with jam is explained by their unconscious desire to add flavor to bulk. The housekeeper who makes a dish composed of cheese and macaroni, or of meat and rice or potato, etc., applies the same principle. The great varietv of pickles, preserves, and elaborate pastry which American housekeepers used to consider necessary represented another instinctive effort to vary, by adding flavor, the monotonv which was inevitable, particularly in winter fare, before the

days of easy transportation and storage brought fresh fruits and vegetables the year round.

If the good housekeeper analyzes the make-up of her meals a little further, she will probably find that she arranges them, perhaps unconsciously, according to more or less definite principles. In most American families the chief daily features of breakfast are bread of some sort with butter, very often fruit, and some kind of breakfast cereal, and coffee, tea, or cocoa, with their usual accompaniments of sugar and milk or cream. This combination is varied by omitting either the bread or the cereal (which is logical, if one wishes to do it, since they provide the same sort of nutrients, though in different form), by changing the kind of bread or cereal, or by combining with them some other materials. If the members of the family are engaged in much muscular work, the meal will be made more hearty by the addition of some hot dish, as eggs, meat hash, creamed fish, bacon, and possibly honey or sirup. If their work is light, however, less variety or smaller portions will probably be preferred.

The custom of serving fruit at breakfast is undoubtedly healthful and not extravagant if low-priced fruit is chosen. Of course, it may be cooked or canned fruit, if this is more convenient. It does not increase the housekeeper's work so much if it is served with the other breakfast dishes as it does if made a separate course, for each course means extra time and service. This is a commonplace illustration of the principle that the housekeeper who has many demands on her time or who has limited help should select ways of service which are simple and time-saving rather than those suitable for families where other conditions prevail. Well carried out, the result is pleasing in either case.

Tea, coffee, or cocoa is usually taken at breakfast and other meals as pleasant flavored hot beverages only, and owe their food value mainly to the cream, milk, or sugar used with them. Cocoa itself has a greater food value, but, if the beverage is made with water, the difference in the food value of a cupful is not very large, as the amount of cocoa used per cup is not great. When made with milk, it is, of course, more nutritious. The value of milk as a beverage must not be overlooked, especially in the case of children. Skim milk is not so hearty as whole milk, but it is still a nutritious food

and might well be used more freely than it is, especially where economy is necessary.

Dinner, the heaviest meal of the day, usually has a meat or fish dish as its principal item, with vegetables and bread and butter, and perhaps a relish, such as jelly, to accompany it, and a sweet dessert to "top off with." If the rest of her dinner is lighter or simpler than usual, a good manager often finds it worth while to let a soup precede the meat. This adds to the attractiveness of the meal and need not mean much extra work. Unless it is a thick broth or is made with milk, the soup has little nutritive value, but it is usually relished, especially in cold weather, and is often an economical way of using up left-overs. The serving of a little soup as an appetizer for the first course of dinner is a common custom in homes where somewhat elaborate meals are the rule. Since it adds little to the nutritive value of the meal, the very general omission of soup as a regular part of dinner in homes where labor saving is sought is a sensible custom. A way of piecing out a very simple meat course is to make the vegetables especially attractive and more nutritious, perhaps serving escalloped potatoes, which have milk and butter added, or macaroni and cheese instead of plain boiled potatoes; or, if the family is fond of such things, providing some kind of simple vegetable or fruit salad, perhaps as a separate course. On the other hand, if some expensive cut, such as beefsteak, is the main feature of the meal, the other parts of the dinner may be made simpler than usual and the total expenditure kept not far from the average, or an expensive meal on one day may be followed by a judicious use of left-overs the next day. In parts of the country where good fresh fish is available it makes an excellent substitute for meat, for sea food has a similar nutritive value, usually costs less, and is quite worthy of more frequent use than is common. Dried, pickled, and smoked meat and fish also have their uses to vary the diet, and can often be used for economical dishes. Cheese, eggs, beans and similar legumes, and nuts are other foodstuffs which may be used for the preparation of dishes to replace meat if one wishes to do so.

In choosing the vegetables for a meal, it is worth while to remember that potatoes, both white and sweet, the staple carbohydrate vegetables, contain much larger proportions

cf nutrients than most vegetables. They resemble cooked macaroni, rice, and hominy in food value, and these can be used to take their place when convenience or the wish for variety makes this desirable. It would be better judgment not to serve several of this group at the same meal, not because, as it is sometimes stated in popular literature, the body is harmed by receiving several sorts of starch at one meal, or because one would overeat of starchy foods, but because the meal would be better balanced as well as more in accord with good practice if it included other types of vegetables instead of duplicating those of similar composition. Green vegetables, such as beet tops, kale, spinach, chard, and other pot herbs, fruits like tomatoes, green corn, green peas, and string beans, and the highly flavored root vegetables, such as parsnips and turnips, should be used in combination with the more nutritious kinds, not only for the sake of their flavor, but also for furnishing the body with valuable chemical substances, especially mineral elements.

Dried beans, peas, cowpeas, and lentils contain a good deal of nitrogenous material as well as starch, and can be used with economy to lessen the amount of meat. Thus the old custom of serving baked beans, peas, and bacon, and similar dishes, as the heavy dish of a meal is justified on the ground of nutritive value.

The custom of finishing dinner with a sweet dessert is almost universal in this country and is, on the whole, a reasonable one. Badly cooked pastries and puddings very often cause digestive disturbance, but the simpler kinds, properly made, are wholesome and are fairly nutritious, and fruits, fresh, dried, or cooked, and nuts are always in order and easy to serve. The desserts that require much time and labor to prepare are usually not worth while for ordinary family use, though suitable enough for special occasions. On days when the housework is especially heavy it may be good management to substitute fresh fruits or preserves with cakes or cookies for a "made" dessert. If the rest of the meal is light, a nutritious dessert is in order, and milk, eggs, butter, and sugar are ingredients which contribute materially to the food value of such dishes.

Supper is usually a much lighter meal than dinner, although in many families it includes one hot dish and a sec-

ond course of preserves and cake. Here, as at breakfast, some kind of bread with butter and a hot beverage form the basis of the meal with an appetizing dish of eggs, meat, cheese, or vegetables to supplement them. This is the meal at which the capable housekeeper most shows her ability in using up left-overs, providing appetizing surprises which do not require much new material or time. It is mistaken economy to add a good deal of expensive materials in order to use up things of little value or to attempt fussy dishes that require long preparation. As far as everyday supper is concerned, it is usually good policy to avoid elaborate dishes and let the most of the time and strength expended for such things go to the main meal of the day. This is especially true where the women of the family do all the work.

While noon dinner and supper are the rule in most rural districts and smaller communities, in other parts of the country, as everyone knows, lunch and evening dinner take their place, as is inevitable where the wage earners must be away from home all day long. In such cases, what has been said about supper applies to lunch. If some of the family carry their lunch away with them, bread and butter again form the usual basis of the meal, with cold meat, cheese, hard-boiled eggs, or some other appetizing as well as nutritious food, and perhaps fruit and cake to complete and vary it.

LABORATORY WORK AND COOKING PROBLEMS.

Modern science has been applied to the problems of cooking as in the case of menu making. It explains and tests the old-fashioned methods, helps in the finding out of new ones, and shows the relation of the preparation of food to dietetics, physiology, and hygiene. From the scientist's point of view, cooking is, ordinarily, applying heat so that it produces desirable physical and chemical changes in the raw material. It also sterilizes food, if need be, as any parasites, molds, or bacteria, etc., that may be present are destroyed by the heat. Sometimes, as in the case of a cereal like oatmeal, the consistency of the material is so changed that what would otherwise be a hard mass difficult to bring into condition to be worked upon by the digestive juices is in proper condition for eating. In other cases, as with broiled and roasted meats, pleasant flavors are developed. In some

instances, as in the case of bread making, the changes are much more complicated. The proportion of yeast or other leavening agent to be used with different kinds of flour and with different methods of mixing dough has been carefully tested in connection with the nutrition investigations, as has also the digestibility of bread made from different sorts of flour. Well-made bread of all kinds is nutritious and very thoroughly digested. The use of several kinds is an easy way of securing variety in the diet.

The effect of cooking upon vegetables has been noted, and the reason given for such points as the strong odor and supposed indigestibility of cabbage. As the cabbage cooks, the heat breaks down the compounds which give the characteristic flavor to it and volatile bodies are given off, some of which contain sulphur. If the cooking is done in a well-ventilated place, these persistent odors are carried away. If the cabbage is cooked too long, it changes color, any green portion becoming yellow or brown, and the white portion dark-colored. The flavor also becomes more strong, and there is good reason to believe that overcooked cabbage is a common cause of any digestive disturbance experienced with it and that cabbage cooked only until tender does not cause such disturbance. It is generally true that overcooking green vegetables should be avoided, as it injures flavor as well as appearance. Asparagus, string beans, and green peas are vegetables easily injured by too long cooking. They are at their best when cooked just long enough to make them tender, but not to destroy their attractive color.

Other technical studies have shown the changes which occur when meats are cooked in different ways and the digestibility of the different kinds and preparations of meat. The results indicate that the differences are much less than is commonly supposed, all kinds and cuts prepared in the usual ways being very thoroughly digested.

FOOD AND ITS CARE IN THE HOME.

People used to think that cleanliness was mainly a matter of personal preference. Since the bacteriologists have shown that diseases as well as decay and loss of material are often caused by micro-organisms which are commonly harbored in filth and dirt, we have come to know that dirt is not only

disagreeable, but is also dangerous, and that cleanliness is nowhere more necessary than in all that pertains to food.

Perishable food materials are particularly likely to spoil if they are exposed to dust or kept in warm, damp places which encourage the growth of molds and bacteria. One of the popular bulletins of the department discusses the care of food in the home and suggests practical, inexpensive ways of keeping it properly. Every up-to-date dairyman and the public, too, know the importance of absolute cleanliness in handling milk. If one applies the same reasoning to other food materials it is evident that the kitchen and pantry need to be taken care of as scrupulously as the dairy and that the housekeeper ought to be as careful in cooking the food she serves as must those who handle milk. So much has been said about the danger of flies as carriers of diseases that it seems as if everyone must realize the importance of keeping them out of the house, especially out of that part of it where food is kept or eaten; yet thorough screening is still far from usual, even in kitchens and dining rooms, and many families seem careless of this very real danger.

AVOIDING WASTE OF MATERIALS AND TIME.

Another problem which vexes the thrifty housewife is that of waste. From the dietary studies conducted by the department, and from other data, it has been estimated that in American families the waste varies from practically nothing to one-fifth of the edible portion of the food purchased. The waste may be due to careless buying, improper storage, buying materials which contain large amounts of more or less useless substances, such as meat bones or the skins, seeds, or tough stems and leaves of vegetables; preparing foods in a careless way, so that little is eaten and much wasted; or, what is perhaps the most common fault of all in this country, providing and serving more than the family will eat and not using up all suitable left-overs for making appetizing dishes. It takes considerable skill to estimate exactly how much of each dish should be prepared for a given meal, but therein lies one of the great secrets of economical catering. Such skill must be acquired largely by experience, but the more the housekeeper knows the ways of observing and recording data and of the nature of her materials and their properties,

the easier it will be for her to profit by her experience. Information on these and related topics has been obtained in connection with the study of food and nutrition problems.

The waste of materials is not the only waste that is found in the household. There is often a waste of the housekeeper's time and strength which, though it may not show in the cash account, is just as bad economy. A good housekeeper considers the labor involved in preparing a meal just as much as she does the materials, and will weigh the question whether this simple or that more elaborate dish is really economical or worth while when the labor supply is short. She will see that the cookstove, sink, cooking table, and other kitchen furniture are so placed that she can work conveniently and not waste time and strength by walking needlessly from one to the other. She will also try to plan the preparation of the meals so that one part of the work will dovetail into another and, in general, try to make "her head save her heels."

This question of saving work in the kitchen leads to the very important one of household conveniences and labor-saving devices. The housekeeper on the farm, or in the small town, has the advantage of home-grown vegetables and other foods, and with a little time and trouble supplies her table with much which is costly in larger communities. No one can deny, however, that the city housekeeper usually has an advantage with respect to conveniences, for her kitchen invariably has running water, a good sewerage system, and often a gas stove and a convenient ice box, not to mention its nearness to markets and to bakeries and shops, where she can buy things ready to eat in an emergency. In far too many rural homes, on the other hand, water must be carried in and out, coal or wood and ashes must be carried long distances, and often even such simple conveniences as sinks, window boxes for keeping food cool, etc., are not found. Although it is often harder to get help in the country than in town, and outside aids to housekeeping, such as laundries, are seldom accessible, there are generally fewer of the labor-saving devices, such as washing machines and other laundry devices and labor-saving cooking utensils, in use in the country than in town households of corresponding means. Many progressive farmers realize that it is not only unfair but poor

economy in the end not to give the housekeeper her share of new equipment. Family welfare depends much more upon having the home maker in good health and spirits than it does upon a few extra dollars in the bank, and making the farm as attractive as circumstances allow is one of the surest ways of preventing the children from becoming dissatisfied with country life. Information on such matters as home conveniences is contained in bulletins which the Department of Agriculture has issued.

CONCLUSION.

This survey of some of the results of the nutrition investigations and of the problems to the discussion of which the nutrition publications contribute shows how the whole question of home betterment is bound up with food and its preparation. If the housewife can learn to make a wiser use of her resources and can economize her time and strength by careful planning and by adopting labor-saving devices, she can provide her family with as wholesome and economical and at the same time more healthful meals, and can lessen her household labors, and so can have more leisure and energy to cultivate other interests also.

The Department of Agriculture feels that one of the most interesting results of its work is that people at large have come to regard it as a bureau of information. This is as true of the studies of food and its nutritive value and other features which bear on domestic science as of any other branch of its work, and it is a gratification to find that each year more housekeepers present their problems and ask for information regarding food and other matters of home management. Such close relations with the housekeeper and with educational institutions seem to demonstrate not only that this work of the department for the homemaker is of scientific value, but also that it is of direct practical aid to the housekeepers of the United States in their efforts for efficient and rational home life.

No one realizes more clearly than those concerned in it how broad is the field for such work and how few relatively of the housekeeper's problems have had the careful study which they merit. Clothing, household equipment, labor-saving devices, home conveniences, home sanitation and

hygiene, the relation of right methods of work to the prevention of fatigue—these are some of the topics which are as much in need of study as are questions of food and economics of the household. Methods of study and ways of bringing the results of laboratory research to the housekeeper already tried and found good in department work are available and as well adapted to the study of these problems as to those in which they have been already tested. It speaks well for the housekeeper's interests in the future that the Department of Agriculture is giving the matter attention and endeavoring so to adjust its activities that it may still further meet the housekeeper's needs, for it realizes that the housekeeper is the great factor in determining the use of agricultural products, and, more important still, that in her hands is the welfare of the family.

PRACTICAL TREE SURGERY.

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INTRODUCTION.

SOME eminent botanical writers have stated that if all the external factors which influence the growth of a tree are favorable there is no theoretical reason why it should not live in a healthy condition and increase in size indefinitely. These statements obviously are based upon the well-known fact that the increase in the size of a tree trunk is due mainly to the new layer of wood which is formed each year beneath the bark on the outside of the old wood. If a tree were never attacked by insects or by organisms which cause decay, never injured or broken by storms or mutilated by men or animals, there undoubtedly would be a much greater number of large and healthy trees than exist at the present time. Probably no tree ever experienced the ideal conditions suggested above, not even for a comparatively brief period of its existence. Consequently, the conditions that we commonly regard as normal or average for tree growth are really far from ideal. Throughout its life a tree is subject to injury by insects, mechanical forces, and disease. Again, trees, like human beings, may become unhealthy as a result of improper food, air, or water, or an insufficient amount of either, or they may become sickly and die from the effects of noxious gases.

In considering the subject of tree surgery it is important, first, to become familiar in a general way with the parts of a tree which are directly involved, their structure, their importance to a living tree, and how they are affected by the surgical methods employed. Owing to the lack of this knowledge, many serious blunders have been made in connection with the care of mutilated, injured, and diseased trees.

PARTS OF A TREE AND HOW THEY WORK.

GENERAL DISCUSSION.

A tree is composed of three main parts—the root, the stem (trunk and branches), and the leaf. The roots serve not only for anchorage, but are the main passages for the entrance of water into a tree. Practically no water enters elsewhere. It enters chiefly through the very small roots, passes into the larger roots, then up the trunk, and out into the larger and smaller branches to the leaves. In moving from the roots to the leaves it passes mainly through the sapwood (Pl. XVI, fig. 1, *b*), that portion of the wood which lies immediately beneath the bark and cambium. The sapwood is of a lighter color in many trees than the heartwood (Pl. XVI, fig. 1, *a*) in the central portion of the trunk and limbs, and varies in thickness from a quarter of an inch to 2 inches or more, according to the kind of tree. The heartwood is practically dead tissue and gives rigidity to the tree. It is not active in conducting sap, and thus it may often be partially or completely removed without causing serious injury to the tree beyond impairing its strength.

Not so with the sapwood, for if any great amount of this, as measured around the trunk, is removed, the tree may be seriously injured or killed. Since the sap moves upward primarily through the microscopic tubes which run lengthwise in the sapwood of roots, trunk, and limbs, it is possible to remove a long and narrow strip of sapwood extending parallel with these tubes with less injury to the tree than would result from cutting out a shorter and smaller, but broader, area to an equal depth. This is due to the fact that the broader cut severs and renders useless a greater number of these sap-conducting tubes.

When the water finally reaches the leaves, the larger part of it escapes in the form of vapor. Unless the water which is lost by evaporation is promptly and constantly replaced from the soil by the roots, wilting will result. Should this wilted condition continue for any great length of time the tree, or portions of it, may be permanently injured. Wilting may also result from certain abnormal conditions, such as a sudden application of common salt or other chemicals to the soil around the roots, or the removal of portions of the sapwood, or the cutting of the roots.

The tree manufactures its own food. In its simpler forms this consists of sugar and starch, which are made from carbonic-acid gas and water. This work is done only during daylight and almost entirely in the green leaves. Mineral substances are dissolved in the water which enters the tree from the ground. Some of these are of vital importance to the tree and are used in the making of certain more complex kinds of food, though not in the formation of sugar and starch. When formed, the foods are carried through microscopic conducting tubes in the inner bark to those parts of the tree where growth and repair are actively going on and are soon transformed into new tissues or stored at convenient places for future use. While being transported, the foods are dissolved in water, which is present in great abundance in all living parts of the tree.

If a ring of bark completely encircling (girdling) a limb be removed, practically all of the food matter formed in the leaves beyond the girdled area will remain in the limb. This usually results in an enlargement of the limb immediately above the girdled area or in an unusual enlargement of fruits or flowers, provided there are many healthy leaves and only a few fruits or flowers beyond the girdled area. The flow of water in the sapwood from the roots to the leaves is not immediately affected to any extent by removing the bark, although the limb later dies as the sapwood becomes dry beneath the girdled area. If both bark and sapwood are removed, the limb beyond dies very soon.

CAMBIUM.

From the standpoint of tree surgery the most important portion of a tree is the very thin, usually watery, layer of young tissue located between the bark and wood of all healthy parts of a tree. This is the cambium (Pl. XVI, fig. 1, *c*). It is the layer that splits or slips so easily when the bark is removed in making the familiar willow whistles in the spring. During the growing season it is constantly giving rise to new cells on both sides; on the outer to new layers of bark cells, on the inner to new layers of wood cells. This results in the youngest wood being on the outside of the old wood and the youngest bark on the inside of the old bark. If a portion of

the cambium is killed, no more new wood or bark can again be formed under or over this area. The living cambium surrounding the dead area will, however, give rise each year to a new layer of wood and bark unless growth is inhibited by disease or further injury. This new growth will gradually push out over the dead area and may eventually cover it (Pl. XVI, figs. 2, 3, and 5). Such dead spots furnish favorable points for the entrance of insects and organisms which cause decay.

The formation of all new wood and bark and the healing over of all cut stubs and dead areas are due solely to the activity of the living cambium; consequently, it is of utmost importance that the cambium be protected from injury at all times. Many failures in tree-surgery work have been due wholly to injuries to the cambium. During the winter the cambium remains alive but inactive, and is then least liable to injury. In the spring, when the buds and leaves are unfolding, it contains much water, is actively growing, and is then most susceptible to injury.

CORKY OUTER BARK.

The oldest bark is on the surface of the trunk and limbs and is composed of dead, corky tissues which are constantly being worn away in the form of small fragments by the action of wind, rain, and other external agencies (see Pl. XVI, fig. 1, *e*). Parasitic diseases and organisms which cause decay can rarely gain entrance into the interior of a trunk or limb if this dead, corky bark and the cambium beneath it remain uninjured.

OBJECT OF TREE SURGERY.

It is a well-known fact that trees are subject to all sorts of injuries, from sources too numerous to mention. In a great majority of cases these injuries are allowed to remain untreated—often for years. Rot-producing fungi commonly gain entrance at these places, and eventually the original inconspicuous or unobserved injury develops into a comparatively large area of decay. The real aim of tree surgery is to repair the damage resulting from such neglected injuries and rotted areas.

PRINCIPLES INVOLVED.

In most tree-surgery work a few fundamental principles must be observed in order that permanent good results may be realized. These may be summarized as follows: (1) Remove all decayed, diseased, or injured wood and bark. When on small limbs, this can often best be done by removing the limb. On larger limbs or on the trunk it may at times mean the digging out of a cavity. (2) Sterilize all cut surfaces. (3) Waterproof all cut surfaces. (4) Leave the work in the most favorable condition for rapid healing. This will often mean the filling of deep cavities. (5) Watch the work from year to year for defects. If any appear they should be attended to immediately.

QUALIFICATIONS OF WORKMEN.

Tree surgery, or, more properly, tree repair work, is not a mysterious art known only to a favored few who alone are fitted to undertake it, as some interested persons would have tree owners believe. It can be undertaken by any careful man who has a good general knowledge of the structure and life history of a tree, its normal manner of covering wounds, and how insects and decay organisms cause damage, provided he can handle a gouge and mallet, a saw, and a tar brush and applies in a practical manner his knowledge of the anatomy of a tree, together with a generous admixture of good common sense. For work in the tops of trees he will also need a clear head and ability to climb. Many tree owners and many persons in charge of private estates are well qualified to undertake tree surgery if the requisite time is available and they will familiarize themselves with the fundamental principles and operations underlying the work, at least to the extent presented in this article.

The impression should not be gathered from what has just been said that there is no advantage in practice and training of the proper kind. On the contrary (in commercial work, particularly), practice and training develop speed in working and quickness in determining the right thing to be done, but they do not necessarily mean any greater care or thoroughness in the work. It is safe to say that a man who takes care of his own trees or carefully supervises the

work of those attending to them will be likely to know definitely whether or not the work is thoroughly and properly done.

METHODS IN TREE SURGERY.

PREVENTIVE MEASURES.

It is no easy matter to find a place where the well-worn phrase "prevention is better than cure" could be applied with greater appropriateness than in connection with tree surgery. Ice or wind may break limbs or uproot trees which injure others as they fall. Horses commonly gnaw away portions of the bark of street trees unprotected by tree guards. Telephone, telegraph, and electric linemen with their climbing spurs and saws are notorious mutilators of shade trees, especially in towns where the trimming of trees is not regulated by law. Poorly insulated electric wires of high voltage often discharge heavy currents through the trees. Wheel hubs frequently tear away large pieces of bark. After a few years, decay may penetrate into the interior of the tree from any or all of these injured places (Pl. XVI, fig. 4). This decay may increase from year to year until large limbs, or the trunk itself, become so weakened that they are easily broken by violent storms (Pl. XVI, fig. 6). It requires comparatively little time and expense to clean and paint a fresh injury. It often requires much time and expense to treat properly the same injury after it has been neglected for a few years. Almost every large decayed cavity has resulted from an injury which would have required comparatively little time and effort to clean, sterilize, and waterproof at the time it occurred. The most economical and reliable remedy for a decayed area consists in attending to an injury as soon as it is made, perhaps 20 or 30 years before it becomes a menace to the tree. This fact should never be forgotten by tree owners or persons who are charged with the care of trees. If put into practice, it will insure a profit of many hundred per cent on the original outlay.

TYPES AND SCOPE OF WORK.

In its simplest type, tree surgery, as it is popularly understood at the present time, consists in removing dead or decayed limbs or stubs from a tree and treating the scar

PROPERLY TREATED INJURIES, SHOWING NORMAL HEALING, AND UNTREATED INJURIES, SHOWING NORMAL PROGRESS OF DECAY.

Fig. 1.—Cross section of a tree trunk showing location of parts: *a*, heartwood; *b*, sapwood; *c*, cambium, *d*, bark, *e*, corky outer bark. Fig. 2.—A scar beginning to heal over. (Note that it heals more rapidly at the sides than at the top and bottom.) Fig. 3.—A scar about three-quarters healed over. Fig. 4.—Cross section of a 7-year-old blaze on a quaking aspen which has nearly healed over. (Note the large area of decay which originated at the ax cut. The line on the wood indicates the proper shape of the cavity if this had been excavated.) Fig. 5.—A scar from a cut limb entirely healed over. Fig. 6.—End of a log, showing a small opening into the large decayed area; only a shell of sound wood remains.

REMOVAL OF LARGE LIMBS, SHOWING PROPER AND IMPROPER METHODS.

Fig. 1.—A heavy limb improperly cut, showing the stripping as the limb falls. (Compare with Figs. 2, 5, and 4.) Fig. 2.—Removing a heavy limb; the first cut on the underside is to prevent stripping. Fig. 3.—Removing a heavy limb; the oval scar has been somewhat pointed with a gouge above and below to facilitate healing. Fig. 4.—Removing a heavy limb; the third cut to remove the stub shown in fig. 5 has been completed. Fig. 5.—Removing a heavy limb; the second cut completed, the limb has fallen without any stripping. Fig. 6.—Improperly cut and untreated stubs. The bark of these stubs died mainly as a result of severing all the food-producing organs (leaves) above; decay has entered the trunk from these stubs. (Note that the successive stages in removing a heavy limb are shown in figs. 2, 5, 4, and 3, in the order indicated.)

LONG CAVITIES EXCAVATED THROUGH SEVERAL OPENINGS AND A SHORT CAVITY EXCAVATED THROUGH ONE OPENING.

Fig. 1.—Cavities in two trees excavated through small openings cut in the trunk. It would be better to make the openings oval and pointed rather than square or round. Fig. 2.—An old injury caused by horses gnawing the bark. Fig. 3.—The injury shown in fig. 2 excavated and ready for tarring prior to filling.

DETAILED VIEWS OF EXCAVATED, BOLTED, AND CEMENTED CAVITIES.

Fig. 1.—Cross section of a young tree trunk showing how the new wood and bark grow into an unfilled cavity from the margin. (The line on the wood indicates the amount of excavating that would be needed before filling the cavity.) Fig 2.—Cross section of a cavity in a trunk, showing the manner of using a single-headed bolt and of placing nails when there is little or no undercutting. Fig. 3.—Cross section of a tree trunk showing the manner of using two single-headed bolts to brace a cavity. Fig. 4. The oval washer (the best kind to use) showing the proper method of countersinking and bolting. (Compare also figs. 2 and 3.) Fig. 5.—Cross section of the tree trunk shown in fig 2 after it is filled with cement. (Note that the surface of the cement conforms with the general shape of the woody portion of the trunk and reaches only to the cambium.)

with an antiseptic and waterproof covering to prevent decay while healing. Another type consists in cutting out the decayed and diseased matter in trees and filling the cavities with cement or other material to facilitate the normal healing-over process. This is often referred to as "tree dentistry," a term which very aptly indicates the character of the work. Filled cavities do not increase the strength of the trunk or limb to the extent that is generally supposed.

DEAD OR DISEASED BRANCHES.

The work under this heading can be regarded as comprising but two essential operations: (1) Removing the branches in a manner that will prevent injury to the surrounding bark and cambium, and (2) sterilizing and waterproofing the scars.

REMOVING BRANCHES.

For the work of removing branches, the most essential implements are a good-sized saw with teeth so set as to make a wide cut, a gouge, a chisel, a mallet, and a strong knife. For cutting limbs near the ground these are the only necessary implements. For limbs situated elsewhere a ladder may be needed; also, at times, a rope.

A large limb should never be removed by sawing through from the upper side, as this usually strips the bark and wood below the scar (Pl. XVII, fig. 1). The proper way is to make the first saw cut on the under side, from 6 inches to a foot beyond the point where the final cut is to be made (Pl. XVII, fig. 2). It should reach from one-fourth to one-half through the limb. A good time to stop cutting is when the saw becomes pinched in the cut. The second cut is made on the upper side of the limb, an inch or two beyond the first one. This is continued until the limb falls (Pl. XVII, fig. 5). After the limb has fallen, a third cut is made close to the trunk and in line with its woody surface (Pl. XVII, fig. 4). When nearly sawed through, the stub must be supported until completely severed, so as to avoid any possibility of stripping the bark below as it falls (Pl. XVII, fig. 1). The first and second cuts to prevent stripping may be omitted when small limbs which can be held firmly in place until completely severed are being cut.

When the scar is not naturally pointed above and below, it is a good practice on most trees to remove a short triangular piece of bark from the upper edge of the scar and another from the lower edge (Pl. XVII, fig. 3), so as to anticipate its dying back at these points. This makes the scar pointed at both ends, the most favorable shape for healing. It is important that some good shellac be applied with a suitable brush over the edge of the bark, especially the cambium, immediately after the cut is made. If the scar is a large one, it is a good plan to use the knife for one or two minutes and then shellac the freshly cut surfaces, repeating the operation until all the bark around the scar has been shellacked. The full benefit of the shellac will not be achieved if many minutes elapse between the cutting and the shellacking, unless the freshly cut surfaces are visibly moist with sap.

If necessary, the woody surface of the scar may now be smoothed off with a chisel and mallet to conform in general shape with the tree trunk. It is bad practice to leave a stub projecting from a trunk, as shown in Plate XVII, figure 6.

ANTISEPTIC AND WATERPROOF DRESSINGS.

The final operation is to sterilize and waterproof the surface of the exposed wood and bark. For this purpose many preparations have been used. Recent extensive tests by specialists in timber preservation indicate that some of the creosôtes stand far ahead of all other tested preparations in their power to destroy and prevent the growth of certain wood-destroying fungi and that ordinary creosote, although it does not head the list, is far better than other preparations except some of the less known and less available creosotes. Furthermore, creosote penetrates the wood better than a watery antiseptic. In using commercial creosote, it can be applied with an ordinary paint brush over every part of the exposed wood. The entire shellacked and creosoted surface must finally be waterproofed by painting it with heavy coal tar. A single application of a mixture of creosote and coal tar (about one-fourth or one-third creosote) has been quite extensively used with good results. Although one coating of this mixture may at times be sufficient, it is always safer to follow it with a heavy coat of coal tar.

A good grade of lead paint can be substituted for the tar, if desired, although it is not generally considered as satisfactory; or grafting wax may serve satisfactorily for small surfaces. Asphalt and various preparations containing asphalt are excellent waterproof coverings and would doubtless be more generally used were it not necessary to apply them hot. A good and possibly more permanent method of treating the scars is to char the surface slightly with a gasoline or alcohol blast torch and then cover the hot surface with heavy tar or hot asphalt. Although heat is an excellent sterilizing agent, it does not penetrate so well as creosote and it kills back the cambium to a greater extent.

Permanent waterproofing can be secured only when the treated surfaces are watched from year to year and recoated when any tendency to crack or peel is observed. This is an important step, which is almost invariably neglected by tree owners and tree surgeons.

TREATMENT OF CAVITIES.

During the last few years there has been a widespread popular interest in the treatment of decayed places in old trees. Many inquiries addressed to the Department of Agriculture refer solely to methods employed in cementing cavities. This is a logical result of the present extensive use of cement in filling tree cavities. This type of work will first be considered. It can be regarded as comprising three essential operations: (1) Removing all decayed and diseased matter, (2) sterilizing and waterproofing all cut surfaces, and (3) filling the cavity in a manner that will favor rapid healing and exclude rot-producing organisms.

TOOLS.

The necessary tools for digging out decayed matter are few. As a rule, two outside-ground socket-handled gouges (one with a curved cutting edge of about three-fourths of an inch and the other, perhaps, 1½ inches), a chisel, a mallet, a knife, and an oilstone are sufficient for ordinary work. The gouges, chisel, and knife should never be used near the cambium when they lack a keen edge, as dull tools will injure it. In cutting out deep cavities, longer interchangeable handles for the gouges may be necessary. A ladder or

a stepladder will be required if the work is more than 5 feet from the ground.

EXCAVATING.

Usually an old decayed spot may be partially or wholly covered by a new growth of wood and bark at the edges and the visible decayed area be small as compared with that which is hidden. (See Pl. XVI, figs. 4 and 6.) In such cases it is usually necessary to enlarge the opening with the gouges and mallet in order to make sufficient room in which to use the gouges in the interior. This opening should not be any wider than is necessary, for reasons already stated in discussing sapwood, but it may be sufficiently long to reach all the decayed and diseased heartwood with little or no additional injury to the tree.

If the decayed and diseased wood extends some distance above or below the external opening, it is a common practice to cut one or more holes above or below the main opening in order to facilitate the removal of the diseased wood (Pl. XVIII, fig. 1). This results in one or more bridges of wood and bark spanning the long interior cavity. This practice is of doubtful value, partly because it is often impossible to see whether the diseased wood has been entirely removed from the under side of the bridges, but mainly because there is a strong tendency in most trees for the bark and sapwood of the bridges to die and decay as a result of severing the sap-conducting tubes both above and below. If the holes are pointed above and below, there is less trouble from this source. A practice that permits a more thorough cleaning out of the cavity is to make a narrow opening, pointed at both ends and sufficiently long to include all the diseased wood. This often extends some distance above and below the visible discolored area.

The most important feature of this stage of the work is to remove all the diseased and insect-eaten wood (Pl. XVIII, figs. 2 and 3). This excavating must continue on all sides of the cavity until sound, uninfected wood is reached. (See Pl. XVI, fig. 4.) All discolored or water-soaked heartwood should be removed, as this is the region in which the rot-producing fungus is most active. In decayed areas of many years' standing there may be only a thin shell of uninfected wood around the cavity (Pl. XVI, fig. 6), in which case there is

danger of the tree being broken by storms unless braced or guyed, as indicated later under "Guying."

DRAINAGE.

The bottom and all other parts of the cavity should be so shaped that if water were thrown into the cavity it would promptly run out and none remain in any hollow. This feature is commonly called "drainage." It is bad practice to have a deep water pocket at the bottom of a cavity with drainage through an auger hole bored from the exterior. An open hole of this sort often becomes a favorable lodging place for insects or fungous spores.

UNDERCUTTING.

Another important point to be borne in mind in shaping a cavity that is to be filled is to have the sides undercut if possible, so as to hold the filling firmly in place.. Care must be taken, however, not to have the wood at the edges of the opening very thin, as this promotes the drying out of the bark and sapwood at these points. Ordinarily the edges should be at least three-fourths of an inch thick; an inch and a half would be better (Pl. XVI, fig. 4, and Pl. XIX, fig. 1). Inrolled bark at the edges of an opening should be cut back in nearly parallel radial planes, as a rule, to a point which will permit the surface of the completed cement filling to conform with and continue across the cavity the general contour of the woody part of the trunk (Pl. XIX, fig. 1). If it is not possible to undercut sufficiently to hold the filling firmly in place, the alternative method described under "Nailing" can be adopted (Pl. XIX, fig. 2).

As already stated, great care must be exercised in working around the cambium, and all cutting tools must be kept very sharp. The final cutting along the edges of the bark and sapwood can usually best be made with a very sharp knife. This cutting must be followed immediately by a coating of shellac, which should cover the edges of both bark and sapwood.

BOLTING.

Before cementing a long cavity it is advisable to place through it one or more bolts, so as to hold the wood and cement more firmly in place. A cavity 2 feet or less in

length will not usually require a bolt, but long cavities, as a general rule, should be bolted every 18 to 24 inches. Oftentimes a single bolt can be placed so as to support both sides (Pl. XIX, fig. 2). In certain cavities it may be necessary to place bolts at different angles (Pl. XIX, fig. 3). In any case a strip of uninjured cambium at least an inch wide should be left between the edge of the cavity and the bolt. On medium-sized trunks, after deciding where the bolts can most efficiently be placed, a very sharp half-inch bit, sufficiently long to reach through the trunk and cavity, can be used to bore the hole for the bolt. On large, heavy trunks a larger bit should be used. Heavy oval or round iron or steel washers, about three times the diameter of the bolt, should be countersunk into the wood by carefully cutting away the bark at both ends of the hole with a sharp gouge or chisel (Pl. XIX, figs. 2, 3, and 4). The washers should be heavy and ample, but not so broad as to necessitate cutting away a large piece of bark. In most trees when round washers are used it is advisable to have this countersunk area somewhat pointed above and below the washer, for reasons already mentioned. By holding the two washers in place, the length of the steel machine bolt can be determined by measuring through the hole. The bolt must be thick enough to fit snugly in the hole and should project beyond each washer for at least one-fourth inch. The thread at each end of the bolt must be sufficiently long to permit drawing in the sides of the cavity a little as the nuts are screwed up against the washers. A chamfered single-headed bolt may be used, if preferred. Before the bolts are finally put in place the countersunk cuts and bolt holes should be tarred or creosoted, and after the bolts are in place all exposed parts of the bolts and nuts should be tarred.

All split cavities must be securely bolted, particularly near the upper part. If the split comes from a crotch, all decayed and diseased wood should be removed from the split and creosote and tar applied, after which it can be bolted just beneath the crotch, so as to close the crack or at least bring the parts back to their normal position in case decayed matter has been excavated from the crack. If the split is a recent one, a washing of creosote only will usually

be sufficient before drawing the sides together with bolts. Under certain conditions, particularly in large trees, it may be necessary to use a rope and tackle blocks to pull the limbs together some distance above the crotch, in order to properly close the crack before bolting it. When the tackle blocks are used, care must be taken to have an abundance of bagging or other padding between the bark of the limbs and the encircling ropes. All exposed edges of the crack must now be covered with thick tar. Limbs above split crotches may be guyed. If there is a cavity in the crotch, the limbs above it must be guyed before this cavity is filled.

NAILING.

If the cavity has a comparatively large opening or has little or no undercutting, it is the custom to drive flat-headed wire nails into the wood in the interior in order to hold the cement filling firmly in place. In medium-sized cavities nails 2½ or 3 inches long are usually driven into the wood for about half their length (Pl. XIX, fig. 2). The heads of the nails finally are completely embedded in the cement (Pl. XIX, fig. 5). If the cavity is already bolted, it may not be necessary to use many nails, because the bolts help to hold the cement in place.

TREATING.

After the decayed and diseased matter has been completely excavated and the edges of the sapwood and bark shellacked, the next step is to sterilize the interior of the cavity in order that all germs of disease or decay which are present may be killed and that any which may come in contact with the cut surfaces during subsequent operations may be destroyed. As already stated, creosote appears to be one of the best preparations to use. Every cut part of the wood and bark must be creosoted, and over this a heavy coating of tar or hot asphalt should be applied before the cavity is filled.

MIXING THE CEMENT.

A good grade of Portland cement and clean, sharp sand free from loam (1 part of cement to 3 or less of sand) should be used. The mixing can be done in a mortar bin, a wheel-

barrow, a pail, or in any other available receptacle that is sufficiently large. A quantity of dry cement and sand sufficient to fill the cavity should be thoroughly mixed before the requisite amount of water to make a rather stiff mortar is added and the whole mixture worked to an even consistency. In large cavities fine gravel free from loam is sometimes substituted for the sand.

CEMENTING.

For placing the mixture in the cavity a mason's flat trowel and an ordinary garden trowel with a curved blade will be found convenient. A tamping stick, 1 or 2 inches thick and 1 to 3 feet long, according to the size of the cavity, will be needed; also some rocks and a pail of water if the cavity is a large one. A layer of cement 2 or 3 inches deep can now be placed in the bottom of the cavity with the garden trowel and tamped firmly in place. This operation is repeated until the cement is 8 to 12 inches thick. Wet rocks of various sizes may be embedded in the cement provided they do not reach within an inch or two of its outer face. If the mixture is too wet, it will tend to run out of the cavity under the operation of tamping. If too little water has been used, it will not pack down promptly. The top of the 8 to 12 inch block of cement is then smoothed with the flat trowel so that it will slant slightly downward from back to front, in order to facilitate drainage. Over the top of this cement block a double or single sheet of tarred roofing (or thinner) paper is placed after it has been cut so as to fit the cavity. On top of this, another block of cement is built as soon as the first block is sufficiently hard to stand the weight and tamping without forcing any of it out at the bottom of the cavity. If the interior of the cavity extends well above the level of the external opening, it may occasionally be necessary to bore or cut a downward slanting hole from the outside to the top of the interior cavity, through which a watery mixture of cement may be poured to fill the upper part of the cavity and the hole. The main opening of the cavity must be completely closed with the stiffer cement before this watery mixture is introduced. When a block of the cement has partially hardened, it will be necessary to carefully smooth the outer surface or cut it down with the flat trowel to the level of the cambium, taking

CEMENT CAVITY FILLINGS, SHOWING DIFFERENT TYPES AND SUCCESSIVE STAGES.

Fig. 1.—A large cavity in an elm filled with cement blocks separated by layers of tarred paper. Fig. 2.—An excavated cavity ready for treating and filling. Fig. 3.—The cavity shown in fig. 2, which has been nailed and partly filled with cement. The ends of the rods for reinforcing the concrete are sprung into shallow holes in the wood. The wire dam is sometimes allowed to remain embedded in the cement, though it is usually removed as soon as the cement has partially set. Fig. 4.—A later stage of the work shown in fig. 3. The height of the wire dam has been increased. Fig. 5.—The same cavity shown in figs. 2, 3, and 4, several days after the filling was completed.

A DAMAGED CEMENT FILLING, TYPES OF UNCEMENTED CAVITIES, AND CROSS SECTION SHOWING METHOD OF ATTACHING A GUY CHAIN.

Fig. 1.—A cement filling badly shattered by cold weather and swaying of the tree. Fig. 2.—Cross section of a tree trunk, showing method of covering cavities with sheet metal. Fig. 3.—Section of a tree trunk, showing a simple method of attaching a guy chain to a hook bolt. Fig. 4.—A long cavity with nails and cement reinforcing rods in place, ready for filling. This cavity should have been bolted. Fig. 5.—An open shallow cavity ready for creosote and tar. Shallow cavities of this type are not usually filled with cement.

VIEWS SHOWING PROPER METHOD OF FASTENING GUY CHAINS AND BOLTS AND IMPROPER METHOD OF ATTACHING WIRES.

Fig. 1.—Limbs of an elm guyed by several independent chains 15 feet above the crotches. Fig. 2.—A split crotch that has been guyed by means of a long bolt about 18 inches above the crotch. Fig. 3.—A tupelo tree nearly strangled by telegraph wires wrapped around the trunk.

great care that the latter is not injured in the operation (Pl. XIX, fig. 5, and Pl. XX, fig. 1). If the cement is allowed to become too hard to trim with the trowel, it can still, with more or less difficulty, be cut back to the cambium line with a cold chisel and hammer. It is a rule with most tree surgeons to trim back the outer surface of the cement to an eighth of an inch or more below the cambium and then use a layer of stronger cement (one part of cement to one to two of sand) to raise it to the level of the cambium, after the filling has partially hardened.

The thinner mixtures of cement will set more firmly. If any mixtures thinner than the one already mentioned are used to fill a cavity, some sort of cloth or wire dam will have to be used to hold the cement in place until it is hard. For this purpose strips of burlap wrapped tightly around the tree so as to cover the lower part of the opening may be sufficient if the mixture is not very thin; otherwise, a more closely woven fabric, such as canvas or carpet, may be used. This dam at first should cover about a foot of the lower part of the opening. The cavity is then filled with cement to the top of the dam. Wet rocks may be embedded in the cement if they are kept well back from the face of the filling. The top is smoothed and covered with tarred paper, as already described, the height of the dam is increased, and the operation repeated. Before the cement has become too hard, the dam is removed and the surface of the cement finished in the usual manner, either to the level of the cambium at once, or it may be cut a little farther back and a finishing layer of stronger cement applied to bring the surface to the proper level. The surface of the cement must be wet before the stronger finishing layer is applied.

A very large proportion of the cemented cavities which are seen in trees at the present time are made in one piece, without the use of tarred-paper partitions. Long cavities of this sort are particularly subject to the defects mentioned under the next topic, and one-piece fillings are not recommended except for short cavities where these particular objections do not apply. The method employed is only a slight modification of that already described and will readily be understood by a study of Plate XX, figures 2, 3, 4, and 5, and the legends which accompany them. These figures show successive stages of work in the same cavity.

The edges of cement fillings in the crotches of limbs are especially difficult to keep water-tight. Besides bolting the cavity and guying the limbs above it, the crevices at the edges of such cement fillings must be made as nearly waterproof as thick tar or asphalt can make them.

After the cement filling has become thoroughly dry, the outer face may be painted with coal tar or paint, especially around the edges where cracks are likely to appear. This should not be done for several weeks after the cement has been put into the cavity.

DEFECTS IN CEMENT WORK.

Although fillings made with cement mixtures (cement mortar and concrete) have many, and oftentimes serious defects, this material is so cheap and so easily handled that no other at the present time is so generally used for the purpose in this country. The most serious defects in cement mixtures are directly due to the hardness and rigidity of the cement after it has become dry. This inflexibility results in cracks appearing across the cement of long fillings (where not put in in sections or blocks, as recommended here) as the tree sways back and forth in the wind (Pl. XXI, fig. 1). Rods for reenforcing the concrete are often placed in large cavities which are to be filled in one block (Pl. XXI, fig. 4).

During a cold period in winter, particularly one that has been preceded by warm weather, the wood of an unbolted cavity may draw away from the cement, often leaving a comparatively wide crack (Pl. XXI, fig. 1). Sometimes, by the contraction of tho wood on a cold day, the tree itself will split above or below the filling, or oven through the cement when the cavity has been nailed but not bolted. This cracking may be prevented to some extent by having nailed cavities with a vertical partition of tarred paper extending throughout the length of the filling. On the other hand, the cement filling forms a surface over which the new wood and bark can form during the growing season, and if the decayed and diseased matter in the cavity is entirely removed before the cement is used, it very largely, if not entirely, checks further decay. If cracks appear in the cement, or the wood draws away from the cement, or the work is not properly done, decay organisms may again gain entrance at the edge of the cement and cause further trouble.

ASPHALT.

There is such abundant promise of future good results from the use of asphalt and asphalt mixtures for covering pruning wounds and filling cavities that it seems desirable to say a few words regarding asphalt, although at the present time the use of this substance to fill cavities has not passed beyond the experimental stage. For covering large wounds it apparently is not equaled by any substance that has been mentioned in this article. The great objection to its use is the fact that it has to be kept melted and applied while hot. This makes the process rather cumbersome and inconvenient, which in itself is a serious objection from many points of view, although a coating of asphalt, properly applied at the outset, will often last for years without special attention. The use of asphalt will doubtless eventually overcome many of the serious faults which exist in cement as a cavity filler.

TINNED CAVITIES.

Sheet tin, zinc, and iron have been quite extensively used to cover cavities. When properly applied, these coverings often serve to keep out disease and insects for a long time. Oftentimes they are improperly applied, or the cavity is not properly treated. Under such conditions these tin-covered cavities are a greater menace to the tree than open cavities. In preparing a cavity for a sheet-metal covering, all the decayed, diseased, and insect-eaten wood is removed in the manner indicated under cement fillings, with two exceptions: There is no need of undercutting the cavity and there should be a narrow half-inch ledge of wood around the edge of the cavity to which the margin of the sheet metal can be tacked. The excavated cavity must be thoroughly sterilized and waterproofed. The sheet metal should be trimmed so that its edges will exactly fit along the edges of the bark. The metal can then be placed on a block of wood and holes an inch or less apart punched or drilled along its margin, through which long, slender, flat-headed brads may be driven into the ledge of wood around the cavity. The edges of the cavity and the inner side of the metal should now be freshly tarred. The metal is then put in place and nailed with a light hammer, allowing the center of the metal to curve outward, so as to conform to the general shape of the trunk (Pl. XXI, fig. 2).

The curving of the sheet metal will reduce the danger of its being ripped off at one or both edges as a result of the expansion and contraction of the wood caused by changes of temperature. Two or more pieces of sheet metal with overlapping joints should never be used unless these joints are soldered air-tight. The final operation is to tar or paint the outer surface of the metal cover, taking special care that the tacked edges are made as nearly air-tight and waterproof as tar or paint can make them. If the insect tunnels were not all gouged out, the cavity should be fumigated by saturating a wad of cotton waste with carbon disulphid and suspending it in the top of the cavity by means of a string for 12 hours or more before the tin is finally nailed at the top. During the fumigating process the cavity must be tightly closed.

OPEN CAVITIES.

In a tree which is not considered of sufficient value to warrant cleaning and filling the decayed areas or covering them with tin, these may be excavated, sterilized, and waterproofed (Pl. XXI, fig. 5). In this condition they can often be safely left for years if the waterproof covering is renewed as soon as cracks or blisters appear. Cavities treated in this way are probably as safe as ordinary tinned or cemented cavities and have the advantage of easy inspection from time to time. Shallow cavities in valuable trees may be very satisfactorily treated in this manner. The new wood and bark produced by the cambium along the margins will form an inwardly rolled edge (in the manner shown in Pl. XIX, fig. 1), as there is no cement or tin to force it across the cavity.

WHEN TREE SURGERY MAY BE UNDERTAKEN.

As a general rule, tree surgery can be safely undertaken at almost any time of year when the sap is not running too actively and the weather is not cold enough to freeze the cement. In most trees the sap will interfere with the work only from the time the buds begin to expand in the spring until the leaves are full grown. Cement work will be ruined if it is frozen before it is hard. It is not likely to be injured by frost after it has been drying for a week.

GUYING.

Closely associated with the work of tree surgery proper, and often an indispensable adjunct, is the guying of limbs to prevent the splitting of the crotches or to check further splitting. The best place to put these guys depends largely upon the shape and position of the limbs to be braced. This varies so widely in different trees that it will be impossible to give very specific directions for this kind of work.

A simple method of guying a crotch is to place a hook bolt through each limb, with the hooks in the two limbs toward each other and from 3 to 10 feet or more above the crotch (depending upon the size, position, and length of the limbs) and slipping the end link of a stout chain over one of the hooks (Pl. XXI, fig. 3), while at the proper place in the chain to make a sufficiently taut guy a link is slipped over the other hook. The rest of the chain can then be cut away, if desired (Pl. XXII, fig. 1). Modifications of this method may be used where three or more adjoining limbs are to be guyed collectively. A simple method is to place a hook bolt through each limb at the proper place and then hook a link of the chain over each bolt hook at any desired point, one of the hooks serving to hold the two end links of the chain. The precautions already mentioned under "Bolting" should always be followed, so far as they apply to boring and tarring the hole and countersinking the washers of the bolts.

A turnbuckle rod or bolt is much better than a chain when the guy is to be kept perfectly taut at all times. Furthermore, this rod permits a ready tightening of the guy within certain limits, should it later become necessary. If for any reason the guy is to be placed within a foot or two of the crotch, a single long bolt can often be used to better advantage (Pl. XXII, fig. 2), and sometimes a single long bolt can be used in place of a chain or a turnbuckle rod where the guyed limbs are not likely to twist much as they sway in the wind.

Occasionally it may become necessary to guy a whole tree in order to prevent the breaking of the trunk where an unusually large cavity leaves only a thin shell of sound wood, or to prevent the tree from tipping over. This can be accomplished by attaching four guy chains or ropes to

the tree about halfway from the ground to the top of the tree and having these slant downward at an angle of about 45° to four short, stout posts set firmly in the ground about equidistant around the tree (e. g., on the north, east, south, and west sides of the tree). The method of attaching the guys securely to the posts is immaterial. The method of attaching them to the tree is important. If the guying is for temporary purposes only, two broad bands of leather or stout canvas or other strong material, each long enough to make a loop at least twice the diameter of the trunk or limb to be encircled and 4 to 6 inches wide, may be passed around the tree or some favorably situated limb and two adjoining guys attached to each loose loop. If a more permanent guying is needed, two eyebolts (or hook bolts) can be placed through parallel creosoted holes in the trunk or limb about halfway up the tree, one about 6 inches above the other. The eye of one bolt should be on the opposite side of the tree from the other. Two guys from two adjoining posts are attached to each eyebolt. The chafing of a limb against a guy can be prevented by padding the guy if the latter can not be so placed as to clear all limbs.

Limbs or trees should never be guyed by passing wires, chains, or ropes tightly around them. These may eventually strangle the portions beyond the encircling band. Encircling fence wires, telegraph wires, clotheslines, or guy wires will act in the same way, killing all parts of the tree beyond the wires if these remain tightly drawn around the limb or trunk for any great length of time—occasionally in less than a year (Pl. XXII, fig. 3).

TREES WORTH REPAIRING.

Most ornamental and shade trees having only a few dead limbs are unquestionably worth attention. Others which have many dead limbs or numerous decayed areas may not be worth the expense, particularly if they are naturally rapid-growing, short-lived trees. No one can decide better than the owner of a tree whether it is worth the attempt to save it, because usually the actual commercial value of an ornamental or shade tree has little or nothing to do with the decision. It is generally a question merely of esthetic value, or historic associations, or rarity of the species. A man who has had experience in repairing muti-

lated or diseased trees may be able to say definitely whether it is possible to save the tree, but the owner, who pays the bill, is the one who will have to decide whether the tree is worth the price it will take to repair it. Often the owner will realize a greater degree of satisfaction by having a badly diseased or mutilated tree replaced. In expert hands the moving of large trees is no longer a hazardous undertaking.

COMMERCIAL TREE SURGERY.

GENERAL DISCUSSION.

For a number of years, but particularly within the last decade, the demand for reliable men to repair decaying ornamental and shade trees has greatly increased. This has led many persons and firms to take up this class of work, often as their main line, though more commonly in connection with some nearly related line of work. At the present time there are numerous firms upon whom the property owner may call if he prefers to hire commercial tree surgeons to attend to his trees. In this line of work, as in others, will be found the honest and dishonest man, the reliable and unreliable firm, competing for contracts to care for trees. The earlier pages of this article have been devoted primarily to the interests of the man who prefers to attend to his own trees, or to have one of his regularly employed workmen do it, or to supervise personally the work being done by others. The remaining pages will be devoted primarily to the interests of the tree owner who hires commercial tree surgeons to attend to his trees.

CONTAGIOUS DISEASES.

The writer's observation of the workmen employed in commercial tree surgery leads to the conclusion that few have any knowledge of the manner of growth of fungi which cause disease in trees, or, if they do know something about it, they apparently do not allow this knowledge to modify their methods appreciably. It is extremely important that special precautions be taken when a contagious disease, such as the chestnut bark disease, is infecting a tree. As an illustration of how two types of firms have handled

matters of this nature in the past, two cases out of many which have come to the writer's attention are cited.

A few years ago a firm of tree surgeons obtained a contract to repair the trees on a Long Island estate. Among the trees was a very large old chestnut, which was much prized by the owner, who desired to have it saved. The tree was badly infected with the bark disease and was far beyond recovery at the time the work was undertaken. However, this did not deter the contractors from doing a great amount of work on it, including excavating a cavity in the interior of the tree more than 20 feet long and from 3 to 4 feet in diameter. The foreman in charge informed an inquirer that more than 5 tons of cement (concrete) had been used in filling this one cavity and that it had taken several men a certain number of weeks to do the work. On the day the work was completed the spore threads of the disease-producing fungus were present in great numbers in the furrows of the bark over a large portion of the trunk. The tree was entirely dead in less than 12 months, although the superintendent of the estate was assured by the foreman in charge of the work that the tree would be "alive and flourishing at the end of five years' time."

In contrast, another well-known firm, of a different type, was asked to repair and prune a large chestnut tree on Long Island. The price was to be governed by the amount of work actually done. This tree had several dead limbs and was supposed to be defective in other ways. Before undertaking the work, a man who was well acquainted with the chestnut bark disease was asked by the firm that expected to get the contract to examine the tree. This was done. The examination revealed the fact that the tree had numerous areas of the disease on the trunk and that some larger limbs had been killed by it. Upon receipt of this information the firm declined to undertake any work on the tree, although a half day had been consumed in hauling ladders, tackle, and three men in a two-horse team to the tree in order that a thorough preliminary examination might be made.

The natural inference is that one firm had no interest beyond collecting a good sum of money for work that was worse than useless, while the other placed the maintenance of a good reputation ahead of everything else. One firm

was the worst type of enemy to honest commercial tree surgery; the other, a worthy supporter of it.

IGNORANT WORKMEN AND FAKERS.

Unfortunately for tree owners and the trees themselves, many men who are set at work by an unreliable contractor know little or nothing of the fundamental principles concerning the life history of a tree. In their ignorance, such workmen are likely to make serious blunders through neglecting to do certain important things the reason for which they can not understand. The faker will always slight any stage of the work, no matter how important, if evidence of his neglect can be effectually obliterated or hidden by subsequent operations. There are few more favorable opportunities for practicing frauds of this nature than in the operation of filling cavities in trees. The decayed and diseased wood may be only partially removed, improper or no antiseptic coatings used in the cavity, or no proper drainage provided, yet no one can tell the difference after the cavity has been filled or covered unless the filling or covering be removed. A cavity filled with cement or other material before the decayed and diseased wood has been wholly removed is nearly comparable to a tooth from which the decayed matter has been only partially removed by the dentist before it is filled.

MISUSE OF THE PRUNING HOOK.

Too commonly the ordinary workman will get into the top of a tree and use his long pruning hook to break off the small dead branches, in the same manner that he would use a club for a like purpose. When so used, the pruning hook will inevitably cause many injuries to the young bark of adjoining branches and make wounds through which disease and decay germs can enter. In this manner many new openings for the possible entrance of disease may be created, in addition to the one already existing in the dead branch, for it must be remembered that merely breaking off the branch does not prevent decay from continuing at this point, while every new bruise or wound may furnish a new point for decay to enter.

CLIMBING DEVICES.

On various occasions we have seen workmen in the employ of well-known tree-surgery firms repeatedly jab their climbing spurs into the bark on horizontal limbs where it would have been much easier for them to move about without using spurs at all. The use of climbing spurs on trees should be avoided, or at least severely discouraged. It would be best if they were never used. Every wound made by one of these spurs may become the center of a new region of decay if conditions favorable for the growth of decay organisms exist. The use of spurs should be strictly prohibited on all parts of a tree subject to a contagious disease above ground, especially if the disease is known to exist in the vicinity. A man who uses spurs on the trunk or on limbs that can readily be reached by a light ladder should never be allowed to work on trees. Firms who permit their workmen to do this should be classed as undesirable or dangerous firms to deal with and accordingly avoided. Many trees have been irreparably damaged and left in far worse condition after ignorant or indifferent workmen equipped with climbing spurs and pruning hooks have worked in them than if nothing had ever been done to them. The edges of the soles and heels of leather shoes, to say nothing of protruding nails, commonly cause considerable injury to soft and tender bark. Probably the best and safest footwear, from the point of view of preventing injury to the tree, is some form of rubber-soled shoe, such as tennis shoes or "sneaks." All properly equipped firms of tree surgeons have ladders that will reach 40 or 50 feet or more into a tree. Ladders, ropes, and rubber-soled shoes will allow a man to reach practically every part of a tree that can be reached by climbing spurs.

Reliable estimates indicate that it takes somewhat longer (perhaps 25 per cent on an average) to do the required work on a tree when ladders, ropes, and rubber-soled shoes are used instead of climbing spurs. Consequently, it may be expected that contractors will have their workmen use spurs unless these are specifically prohibited.

RESPONSIBILITY OF TREE OWNERS.

)wners who contract with a firm of tree surgeons to end to their trees are occasionally quite as much to be med for the resulting poor work as the men who do it. s statement refers to those owners who get an estimate having their trees repaired in a proper manner by men) make a business of caring for trees, and then say, in ct, "I've got only half that amount of money for the k, and you will have to do it for that or I will get some else to do it." The reliable man who has named a e that will insure at least reasonably good work has to one of two things under those conditions; either he st decline to do the work or he must lower his price. en these conditions arise, the work is often undertaken a reduced price. This generally means that the work to be of a cheaper grade, possibly done by inexperienced 1, in order that a profit can be realized. A wiser course the owner would have been to put his available money repairing in a proper manner the more valuable of his s, leaving the less valuable ones untreated.

'erhaps in other cases the owner, after getting the esti- e for good work from a reliable firm, will go to another 1, possibly a notoriously unreliable one, and obtain a siderably lower price for the work. Commonly in her instance have any specifications been considered ering just what should be done to the trees beyond the rance of the contractor that the trees would be fixed "as they should be" or "in fine condition." With no e definite understanding than this, too much of the k in the past has been done. In many cases, two or e years later, the owner learns to his chagrin (usually n his own observations) that the work was not properly e and that his money was little better than thrown y. Property owners who have passed through expe- ces of this sort are often the bitterest opponents of tree airs and the most caustic and indiscriminate critics of all sons engaged in this type of work. It might be well such tree owners to ask if, in refusing to pay the price for d work, or in permitting incompetent men to do it ely because they make a lower bid than any reliable 1 could afford to, they themselves are not equally to be

blamed for the poor work. Two men may have very different standards as to what should be done to a tree or what they intend to do to it.

With the completion of tree-surgery work, owners usually fail to realize the importance of keeping close watch of their trees, in order that defects which appear in the work may be remedied promptly and that new injuries elsewhere on the tree may have immediate attention. If a tree is considered by its owner of sufficient value to warrant having it properly and carefully treated by a tree surgeon, it certainly is worth the slight expense of subsequent annual or biennial inspection and the immediate repair of newly discovered injuries at a time when the expense necessary to keep the tree in good condition will be comparatively small.

It should be borne in mind that scars remaining after large limbs have been removed or large cavities cemented are commonly unsightly spots for years, even under the best of conditions. If the scar is a large one, it may never entirely heal over and may consequently remain a conspicuous defect. It might so happen that a particularly large scar would be too unsightly and conspicuous to please the owner, should the decayed matter be removed properly and the cavity filled. Under such conditions he may realize a greater amount of satisfaction in the end by having the diseased tree replaced with a healthy one. For several years at least one well-known firm of nurserymen has been moving large trees (with trunk diameter of a foot or more) with remarkable success; at the same time demonstrating the possibility of moving good-sized healthy trees without their showing apparent adverse symptoms afterwards. Thus it is possible often to replace a diseased tree with a healthy one of similar size without having to wait 15, 20, or more years for it to attain the size of the displaced one.

CONTRACTS.

In order to secure better results in the future than have generally been attained in the past, and to put commercial tree surgery on a basis that will tend to eliminate the fakers, owners are urged to have a definite written contract with tree surgeons whom they employ to take care of their trees.

The best results can generally be attained when payment is to be based upon the amount of work done plus the cost of materials used. Probably most persons, however, will prefer to have the trees examined and a definite price agreed upon before any work is undertaken. In either case there should be a definite written understanding concerning at least certain important phases of the work, in addition to price and methods of payment. The following is suggested as a model for such contract:

(1) No climbing spurs shall be used on any part of a tree.

(2) The shoes worn by the workmen shall have soft rubber bottoms.

(3) Ordinary commercial orange shellac shall be applied to cover the cut edges of sapwood and cambium within five minutes after the final trimming cut is made.

(4) All cut or shellacked surfaces shall be painted with commercial creosote, followed by thick coal tar.

(5) All diseased, rotten, discolored, water-soaked, or insect-eaten wood shall be removed in cavity work and the cavity inspected by the owner or his agent before it is filled.

(6) Only a good grade of Portland cement and clean, sharp sand in no weaker mixture than 1 to 3 shall be used to fill cavities.

(7) The contractor shall repair free of expense any defects that may appear in the work within one year.

If the owner prefers to have a cavity filled with asphalt or other material instead of cement, the contract can be altered accordingly. If it is desirable to substitute some other preparation for shellac, this can be done. Similarly, under certain conditions, various other modifications may be made, although alterations in Nos. 1, 2, 5, and 7 should be made with caution. It may so happen that if all insect-eaten wood is removed, the tree may be dangerously weakened; under such conditions the diseased matter can be removed to solid wood and the cavity fumigated, as described under "Tinned cavities," or the tree may be guyed. If certain crotches are split or particular limbs on some trees need guying, it may be well to include these items in the contract. It may be desirable to include a statement of just what limbs shall be removed from particularly choice trees, and some provision should always be made for the regular inspection of the trees every one or two years.

CONCLUDING REMARKS.

At the present time the science of tree surgery has not attained the recognition and approval from tree owners that it deserves. This may be due in part to the unfavorable impressions created from experiences with fakers, but probably primarily from the disinclination of the owners to spend much money in preserving their trees or from their ignorance of the benefits that may accrue from tree surgery when properly done. Reliable tree surgeons are doing much in a practical way to educate the public as to the benefits of tree surgery Unfortunately, the unreliable tree surgeons are doing much to offset it.

There are methods connected with the work that may in the near future prove to be far superior to some now in common use and recommended here. At present, experiments to test the efficiency of some of these have not been conclusive.

The Department of Agriculture invites correspondence, either from individuals or firms, concerning new methods of treatment or prospective methods, and will be prepared to advise for or against any particular method so far as experience and the results of experiments will permit. It is only by cooperation of this sort that tree surgery can ultimately attain the position that it deserves in the estimation of the general public.

Finally, tree owners are urged to remember at all times the axiom: *The need of tree surgery 15 or 20 years hence may be very largely obviated by promptly attending to the fresh injuries of to-day.*

SUPPLEMENTING OUR MEAT SUPPLY WITH FISH.

By M. E. Pennington,
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SUBSTITUTES FOR MEAT.

MEAT shortage was an old problem to other nations when our Nation was in its infancy. To supplement their supply of meat they turned to the sea for fish and to the poultry yard for fowls, both eminently desirable and economical sources of nitrogenous foodstuffs.

The United States must now deal with the problem of meat shortage. The settlement of our vast cattle ranches and the breaking up of the great pasturage areas into cultivated farms have interfered with one of our natural sources of a meat supply. At the same time the increase in the value of corn has made cattle raising for meat purposes a difficult problem on the small farm. We, too, apparently shall have to turn to the sea and to the poultry yard for nitrogenous food.

We have scarcely begun to utilize our fisheries, while the possible development of poultry raising and egg production is so common a topic in the popular press, as well as in the more stable advice and instruction furnished by the many agencies now assisting the farmer, that it is reasonable to expect more poultry and better poultry within a comparatively short period. Poultry must be raised. This necessarily requires some time, even though it be much shorter than that required for cattle production. The supply of fish, on the other hand, is literally in sight and may be had for the catching, a process which requires some capital and trained labor, but which is infinitely simpler than the hatching, feeding, housing, and slaughtering involved in poultry raising.

One of the greatest difficulties in the way of utilizing our piscatorial resources is the ignorance of the American people, especially of the native-born, well-to-do people, in regard to the kinds of food fishes, their desirability as foods from the viewpoint of both nutriment and palatability, and the methods of cooking which tend to enhance their food value.

We have been so accustomed to meat as the nitrogenous *pièce de résistance* of any meal that fish, if eaten at all, is merely an entrée used more in deference to the established customs of the Old World, or to religious tenets, than in response to a demand on the part of the American diner. Yet Americans are delighted at the delicacy of English whitebait, at the fine flavor of the sole cooked in Paris, and at the appetizing aroma of the smoked salmon in the sandwich so universally served in Germany.

We quite forget that the sand dab of the southern California coast more than equals the English sole; that the pompano of our southern waters, the whitefish of the Great Lakes, and the mackerel and bluefish of the east coast are not surpassed by any of the finny delicacies served in Europe, and that the delicious salmon in the German sandwich is more than likely the product of our own Pacific fisheries exported to Germany because it finds comparatively scant favor at home.

There is also a common belief that fish does not furnish us with as much high-grade food material as meat. Analyses of meat and fish, however, show an encouraging similarity in protein content, as may be seen from the following figures:

Protein content of meat and fish.

Kind of meat.	Per cent of protein.	Kind of fish.	Per cent of protein.
Beef, loin, medium	17.9	Bass, black	20.0
Beef, ribs	17.0	Bluefish	18.8
Beef, round, medium	19.7	Cod steaks	18.1
Leg of mutton	17.9	Flounder, whole	13.8
Neck of mutton	16.4	Haddock	16.7
Loin pork chops	16.1	Halibut steak	18.0
Ham	14.8	Lake trout	17.3
		Mackerel	18.1
		Weakfish	17.3
		Whitefish, whole	22.2

The foreign-born population of the United States are the fish consumers of the Nation. They have brought fish-eating habits with them from nations where fish, not meat, is the more common nitrogenous food. Whereas we have done comparatively little to stimulate our fisheries, the older nations have expended, and now are expending, every effort

to gather the crops that the waters yield so abundantly, and to deliver them cheaply and in prime condition to their people not only along the coast but to extreme inland towns.

THE FISHERIES OF ENGLAND.

England knows she can produce only a portion of her meat supply, but she believes she can produce all her fish supply and also export to other countries. England's fisheries, as a source of her food supply, are considered of very great importance, and the fishing fleet is recognized as bearing an important relation to her navy. An enormous quantity of fish is caught in the fisheries of the United Kingdom (in 1912 the catch amounted to 2,698,400,544 pounds, valued at $64,405,334), and it is distributed speedily and in very good condition. All these factors help to make fish not only a relatively cheap food article but also a popular one. Herring is the most important catch, and the most important fish export going salted or cured in large quantity to Russia and Germany.

HOW GERMANY ENCOURAGES FISHING.

While the United Kingdom encourages her fisheries, it has remained for Germany to take up active pioneer work in developing the production and extending the consumption of fish, especially in the fresh condition.

The German Government has expended large sums for the construction of fish harbors at Geestemunde, Emden, Cuxhaven, and other ports. To encourage herring production, the State has been paying about $952 as bounty toward the building of each sailing vessel, and adding from $952 to $1,428 to that sum for equipment. German ports have exempted all fishing vessels, regardless of nationality, from the payment of tonnage dues. Such methods have resulted in a decided growth of Germany's fishing fleet. For example, between 1899 and 1909 the sailing luggers engaged in fishing increased from 101 to 190, and the steam luggers from 9 to 62. The number of steam drifters increased from 108 to 217 between 1904 and 1911. Yet Germany, as we shall see later, can not begin to supply her growing demand for fish.

Low transportation rates have been made to encourage the shipping of fish to inland districts. For example, fish are sent by express freight at the ordinary freight rate,

which is one-half of the express rate. The fastest passenger trains are also used for fish shipments, the freight rate in this case being again one-half of that regularly charged. In other cases, such as when fish are caught by German vessels and salted at sea, a certain number of miles is deducted from the distance to be traversed, thereby reducing the total cost. From Geestemunde, alone, from 3 to 7 fish trains are made up daily and dispatched inland.

The efforts of the Government to extend fisheries are supplemented by the German Sea Fishery Association. To this association the trawling companies pay $16.60 per vessel, the funds being used for the advancement of the industry in general.

EDUCATING THE GERMANS TO USE FISH.

One phase of the work of the association and one which is supported by the Government, is the education of the people regarding the kinds of fish and their desirability as a food. "A series of cookery lessons was started in Berlin and other large cities, using moving pictures to show the methods of fishing and the varieties of fish, and to aid in explaining their food value. This movement was enthusiastically received and at present articles are frequently being written and issued in pamphlet form which contain helpful and heretofore little known facts regarding sea fish and the best methods of preparing them for the table. As a consequençe the taste for fish has spread amazingly and the various trawling concerns have entered upon an era of prosperity which seems likely to be permanent."[1] Naturally, such an educational campaign has created an exceptional demand for fish, not only near the sea, but more especially inland, where the people, like our own inland population, know practically nothing of sea fish nor how to cook them.

Germany has very wisely turned her attention to the handling of fish so as to preserve quality and prevent waste. Her vessels, like our own, go long distances for their catch. Hence the fish must be packed with care if they are to reach the market in good order. Some of the newer vessels are provided with refrigeration to aid in preserving

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[1] Daily Consular Report, Jan. 25, 1913.

freshness. At Geestemunde, especially, much attention is given to the preservation of food fish, thereby preventing market gluts and utilizing as food many fish that would formerly have been turned over to fertilizer or oil factories.

IMPORTATIONS OF FISH INTO GERMANY.

Though Germany has placed an import duty on fish not caught in German vessels, she is still forced to draw heavily on other than German fisheries for her supply. She never has enough herring, despite the fact that Great Britain sends over a million barrels of the salted fish yearly; Scotland finds Hamburg its best market for its herring trade; and Norway, Sweden, and the Netherlands each contribute heavily. We send to German markets some of our very best fish, especially salmon, for which Germany is, by far, our biggest customer. Between 1905 and 1910, inclusive, we sent to her over $11,500,000 worth of fresh and cured salmon, most of which came from our North Pacific fisheries.[1] Germany uses part of this fish fresh—we send the splendid "steelhead" salmon hard frozen—and smokes most of the fish which is sent in pickle.

The smoked-fish industry in Germany is very important, and by the clever methods in use many fish rather unpopular in the fresh condition are rendered salable at relatively high prices.

DISTRIBUTION AND PRICE OF FISH IN GERMANY.

Many ways of distributing fish have been devised in Germany, ranging from auctions at large fish ports to municipal sales in the large cities. Berlin, for example, has held semiweekly sales of fish at cost in the public market halls to reduce the cost of living. The sales were said to be successful and were extended to certain department stores which retail fish. The fish sold by the Municipal Market Hall Committee were from 1.7 to 1.9 cents per pound cheaper than those sold by the retailers. Under any circumstances, however, the price of fish in Germany is much lower than the price of meat, as may be seen from the comparisons following.

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[1] Cobb, John N. The Salmon Fisheries of the Pacific Coast. Bureau of Fisheries, Doc. No. 751.

Comparative Prices of Meat and Fish in Germany.

Kind of meat.	Price per pound.	Kind of fish.	Price per pound.
	Cents.		*Cents*
High-grade beef in Berlin, 1911.	16.5 to 19.2	Haddock, at auction at Cuxhaven, March, 1913	2.2 to 9.6
Fresh-carcass veal in Berlin, 1911	17.9 to 23.8	Cod	1.7 to 4.9
Fresh-carcass mutton in Berlin, 1911	13.0 to 18.6	Mackerel	.8 to 1.1
Fresh-carcass lamb in Berlin, 1911	15.1 to 19 9	Sole	18.6 to 32.4
		Halibut	8.7 to 18.8
		Whiting	1.4 to 2.6

Despite these prices for fish, however, our fishermen are sending hard frozen steelhead salmon in carload lots from the Pacific to Germany because the German market is a good one, and because "Germany will pay the price for a high-grade fish and our people will not."

The esteem in which fish is held in Europe may be illustrated by the rapid decrease in the number of factories making fertilizer, oil, etc., out of excess catches or of fish not hitherto considered as edible. In Sweden, for example, 20 factories were operating in 1895–96, producing 12,300 barrels of oil and 14,170 tons of fertilizer. Now but two of these factories are running, because all the herring available for food that Sweden can spare are being used as food in Germany and England.

THE FISHERIES OF NORWAY.

Norway also has a growing fishing industry and necessarily so, since her agriculture seems to be practically stationary. Formerly agriculture stood first, lumbering, including paper manufacturing, second, and the fishing industry third in the employment of people. The value of the crops of hay, grain, and potatoes in 1903 was $56,796,436, while in 1912 they realized only $57,834,400. The value of the fish caught in Norway during 1911 amounted to more than fourteen million dollars. The herring trade alone amounted to nearly three million dollars and canned sardines (bristling) were valued at nearly four million.

Manufacturing has greatly increased in Norway during the past five years, and this tendency is reflected in the growth and development of fish canneries and fish by-product fac-

tories. The increased production which marks each year is quickly and readily absorbed, however, and still Germany wants more herring.

CANADIAN FISHERIES.

Our next-door neighbor, Canada, reported for the year 1911 to 1912 a fish industry which totaled $34,667,872. Never before had the value reached the thirty-million mark. The most valuable fish to Canada is the salmon, aggregating, in 1912, 113,673,200 pounds, worth $10,333,070. Lobsters stand second, with a value of nearly five million. Canada sends fish to practically the whole importing world, and is awake to the resources of both sea and inland waters.

UNITED STATES FISHERIES.

The size of the industry in the United States has not been reckoned with certainty since 1908. During that year the amount of our fish and fishery products, exclusive of Alaska, was 1,893,454,000 pounds; including Alaska, we produced 2,111,267,415 pounds. The distribution of this catch was as follows:

Fish catch of the United States in 1908.

	Pounds.	Value.
Atlantic coast division	1,344,665,000	$35,474,000
Gulf of Mexico	117,723,000	4,825,000
Pacific coast	176,150,000	6,839,000
Mississippi River	148,284,000	3,125,000
Great Lakes	106,632,000	3,767,000
Alaska	217,813,415	11,847,443
Total	2,111,267,415	65,877,443

It will be seen that the Atlantic coast produces 69 per cent of the products if Alaska is excluded, and the Pacific coast ranks second, with products valued at 13 per cent. The fresh-water fisheries, with a value of 13 per cent, are also seen to be enormously productive.

The Alaskan fisheries have developed very rapidly during the last few years, both in quantity produced and in breadth of distribution. In 1912 the value of all Alaskan fish and fish products was $18,877,480, a gain of more than seven million dollars in four years. Of this sum $311,307 represents the

value of whale oil, fertilizer, and baleen, an almost negligible quantity when compared with the total.

The most valuable fish to Alaska is the salmon, which is canned, pickled, frozen, and shipped fresh-caught.

Statistics of Alaska salmon.

Preparation for market.	Quantity.	Value.
Canned ... cases..	4,056,021	$16,295,490
Mild cured ... pounds..	4,195,843	399,852
Pickled ... barrels..	34,750	307,422
Fresh caught ... pounds..	1,338,923	101,463
Frozen ... do....	451,043	20,287
Smoked loaf ... do....	2,157	8,628
Total ...	....	17,133,142

THE FISH SUPPLY OF THE UNITED STATES.

The nations of Europe, with the exception of Russia, are forced to depend upon their sea fisheries for the bulk of the supply. We have not only our great length of Pacific and Atlantic coasts, but we have also the Gulf of Mexico and the Great Lakes, sources from which our inland territory may readily be supplied. These waters are practically inexhaustible. We hear constantly of the great decrease in the catch of certain fish, such as the shad and sturgeon, and of the practical annihilation of some fish in definite localities, such as the salmon in New England, but it must be remembered that these statements apply only to those fish which make their way into rivers to spawn, entering in great numbers during a comparatively short period of time and so rendering their capture simple. It must be remembered, also, that many of the fish spawning far up fresh-water streams die as soon as spawning is over. The propagation of the race, therefore, depends upon the preservation of the fry. Our industrial growth has taken but little account of these tiny fish. We have constructed dams and power wheels and permitted factories to discharge poisonous chemicals, and in many most effectual ways destroyed the nurseries that had harbored the young fish until they were strong enough to swim to the sea, and too large to be a comfortable mouthful for the voracious big fish, many of which are almost unbelievably cannibalistic.

Our eastern coast has almost lost the sturgeon and the salmon, and the run of shad is dwindling. The west coast is facing a like diminution, if not extinction, of the salmon, unless it heeds the warning of the East and insures protection for the river-traveling fish against the ever increasing manufactories, and provides sufficient spawning and nursery grounds for the development of the youngsters.

For example, myriads of salmon travel up the Columbia River each year to spawn in the little mountain streams, and die there after the spawning is over. In the olden days these fry worked their way down the little streams, where their enemies were comparatively few, into the lakes that emptied into the rivers, and there they lived and grew until 4 or 5 inches long—"fingerlings," as the fish culturists say—when they were strong enough to compete with the river fish on their run to salt water. Now the agriculturist and the manufacturer of the western slope have found those lakes ideal reservoirs for irrigation purposes, or, very often, for power, so they have built dams and great turbines—and what can a "fingerling" do against such obstructions as those? The fishermen on the west coast say it is just a case of the survival of the most profitable—if agriculture and manufacturing are to dominate, the salmon finally must go. But those who are interested in supplying this great country with food hope that before it is too late enough runs and nurseries will be provided to preserve to the people a supply of these splendid fish that are already world renowned.

Not even in the dimmest distance, however, can we see any diminution in the number of fish in the ocean. Even in our Great Lakes it would seem that we have an unlimited supply. According to practical fishermen, there were more fish in sight in the Great Lakes in the season of 1910 than ever before.

THE UNCERTAINTY OF CATCHES.

For uncertainty of harvest, however, fishing exceeds even the most unreliable crops with which agriculture has to deal. With all the sea to swim in, with powers of speed and endurance, with habits that are quite unknown to us, even such universal market fish as bluefish and mackerel are sometimes taken by the fishermen in enormous quantities and again are almost absent from the catches for a long time. These flush

and scarce periods may exist for years, giving rise to the statements of depletion, but sooner or later large schools again frequent the old grounds and the catches, both in numbers and weight, are undiminished. The seasons for the migratory fishes are as sharply defined as they are for agricultural products. When the season has passed the fish disappear and are not seen again until the following year, or they may run biennially, triennially, or quadrennially. Even when the run is on, a storm, a change of wind, or some inexplicable cause may turn the fish quite aside from their usual course where traps, nets, or other fishing gear await them, or may cause them to take to deep water where they can not be caught. Even the staple varieties may give the fishermen the slip, hence it can readily be seen that with fresh-caught fish only to depend on, market prices may fluctuate widely, since the number of varieties known to the consumer is comparatively small. Since fish have been preserved by freezer storage there has been greater uniformity of supplies and prices.

TRANSPORTATION OF FRESH-CAUGHT FISH.

As a general rule the dominant fish in a market are produced comparatively near by. The catch of the Atlantic, for example, stays almost entirely east of the Alleghenies, except that which is canned or otherwise preserved, which, of course, goes all over the country and is exported. The Gulf and the Lakes and the Mississippi supply the interior and ship but little over the eastern range. The Pacific coast, on the other hand, sends two staple varieties of fish throughout the country, namely, halibut and salmon. These fish are sent (on express schedule) across the continent in carload lots, packed in fine ice, and constitute, with red snapper from the Gulf, most of the salt-water fish supply of the interior. The distribution of Pacific salmon and halibut extends also to the Atlantic coast cities, which are heavy consumers. For some of our fish we are sending to Canada. Smelts, lobsters, and salmon come to us in quantity from Canadian waters, as does, also, much of the "winter caught" fresh-water fish. The latter are obtained by cutting a series of holes through the ice, stringing gill nets from hole to hole, and pulling the nets up through the holes to remove the

ch. This fishing is done when the temperature is below freezing point, sometimes at 40° below zero, Fahrenheit, l the fish are, therefore, frozen almost immediately upon ir removal from the water. They are boxed and held on the until hauled by teams to refrigerator cars and so shipped cold-storage plants in cities. The unparalleled freshness low temperature weather frozen fish, even after months of rage, is a strong argument for the installation of fish ezers as near the source of production as possible.

VARIETIES OF FISH IN THE MARKETS.

The usual consumer near the seacoast has no idea of the ny kinds of fish that are to be found in his market, nor of ir seasonal variation. The east coast housewife asks her dealer for halibut, cod, bluefish, weakfish, or pan fish; the st coast housewife has a little wider range, yet even with her ibut and salmon are so decidedly in the ascendancy that e and shad go a-begging at 5 cents a pound retail. In nt of fact, the eastern coast markets carry the following aple varieties" which may be had the year around:

Staple varieties of fish.

Salt-water fish.		Fresh-water fish.
efish.	Pollock.	Ciscoes (lake herring).
.	Porgies or scup.	Lake trout.
kes or flounders.	Salmon, western.	Whitefish.
ldock.	Sea bass.	German carp.
e.	Smelts.	Buffalo carp.
ibut.	Shad.	
ring.	Weakfish.	
kerel.	Whiting (silver hake).	

Certain other varieties are produced in smaller quantities, fairly continuously, and are known as "limited staple ieties."

Limited staple varieties of fish.

Salt-water fish.		Fresh-water fish.
ter fish.	Skate.	Pike perch.
itas.	Sheepshead.	
kfish (tautog).	Sea trout, southern.	
s.	Squid.	

'Fancy varieties" come in such small quantities or during h limited seasons or from such a distance that the supply not be relied upon.

Fancy varieties of fish.

Brook trout.	Striped bass.	Salmon trout.
Kingfish.	Sturgeon.	Searing.
Pompano.	Spanish mackerel.	White bait.
Red snapper.	Salmon (Atlantic).	White perch.

Even this long list does not by any means include all the fishes that are sold for food in our markets. The Middle West would ordinarily add catfish, suckers, yellow perch, sunfish, and blue pike; the west coast would add barracuda, sand dabs, sole, tomcods, and turbot; and the markets on the Gulf would display an amazing collection of sea food of strange form and color, but most appetizing when prepared for the table according to the French methods still in vogue in that region.

A visit to any large wholesale fish market in the United States is a voyage of discovery to most consumers. They will there see more kinds of fish for sale than they had supposed in the sea. But such a market displays little variety when compared with the fish market of the "Halle Centrale" in Paris, or the wonderful market on the Grand Canal in Venice. Spread out in trays, garnished with green and red and brown seaweeds, arranged to catch the eye by beauty of color and design, are delicacies that our fishermen never trouble to bring on shore because we do not consider them desirable food. The praised soup served in Naples was made from a member of the cuttlefish family—a "squid"—eaten here only by Italians, and used for bait by our fishermen. The much desired "raie au beurre noir" of Paris is, in plain English, just a piece of skate, or ray, that would not be salable in an American market.

WHOLESALE PRICE OF FISH IN THE LARGE CITIES.

In these days of high prices for nitrogenous foodstuffs it is of interest to note the prices of fresh-caught fish prevailing in Fulton Market, New York City, for the five-year period between 1907 and 1911.[1] Ten staple varieties of fish are chosen, namely, halibut (western), salmon (western), cod, haddock, pollock, bluefish, weakfish (or sea trout), flukes (or flounders), roe shad, and sea bass. The accompanying table shows the maximum and minimum wholesale prices for the

[1] Fowler: Prices on Fish. Hearings, Committee on Manufactures, U. S. Senate, 62d Cong. Foods Held in Cold Storage, pp. 440–468.

month of January, because that is the month in which fresh-caught fish are highest priced. It will be observed that 4 of the 10 varieties—cod, haddock, pollock, and flukes—could always be purchased for less than 10 cents a pound even at the time of greatest scarcity, and generally they could be obtained for less than 5 cents.

A similar table made for a summer month such as July would show that these four varieties rarely exceed 5 cents a pound and are more commonly sold for 3 cents or less while even the higher priced fish, such as the bluefish and halibut, seldom reach 10 cents a pound.

Maximum and minimum wholesale prices[1] *on fresh-caught fish in January, 1907–1911, Fulton Market, New York City.*

Kinds of fish.	1907		1908		1909		1910		1911	
	Maximum.	Minimum.	Maximum.	Minimum.	Maximum.	Minimum.	Maximum.	Minimum.	Maximum.	Minimum.
Halibut (western)	$0.14	$0.115	$0.1375	$0.1125	$0.145	$0.085	$0.16	$0.085	$0.19	$0.17
Salmon (western)	.18	.0975	.20	.13	.25	.1075	.1425	.085	.21	.105
Cod	.07	.035	.0925	.045	.075	.02	.05	.035	.085	.055
Haddock	.07	.0275	.07	.05	.06	.015	.05	.035	.065	.035
Pollock	.055	.04	.075	.055	.05	.025	.04	.025	.065	.04
Bluefish	.235	.175	.225	.20	.215	.1475	.25	.205	......	......
Weakfish	.14	.09	.155	.125	.075	.045	.1425	.10	.115	.095
Flukes	.055	.045	.09	.045	.065	.0325	.09	.03	.075	.0375
Roe shad	2.00	1.12	1.25	1.00	1.50	1.15	2.12	1.875	2.875	.80
Sea bass	.0775	.0775	.1375	.09	.11	.05	......	......	.095	.065

[1] Prices are given per pound on all fish except shad, where the prices are given per fish averaging 4½ pounds.

FREEZER-STORAGE FISH.

The foregoing statements apply to fresh-caught fish only, and it must be remembered that winter fishing is of but small moment. Most of the fishermen tie up when winter comes and do not ply their trade until spring. Fortunately for the stability of the markets, but even more fortunately for the supply of food, the practice of freezing the excess summer catch and holding it at temperatures close to zero Fahrenheit until winter time has become so general that from October 1 to April 30, which mark the limits of the storage-stocks season, we have a continuous course of fish in excellent order from the warehouse to the market to be disposed of, generally, at lower prices than the fresh-caught article. For example,

hard-frozen shad sell from December to March for 40 to 50 cents for a 4½-pound fish, while the fresh-caught is generally over $1 and may be more than $2. It is also fair to mention the fact that freezer-storage shad, put in promptly when in prime condition in the spring, are usually much better fish than those winter shad caught in southern waters and poorly handled on their journey to the northern consumer. Only the consumer's lack of information prevents the relative prices of fresh-caught and freezer-storage shad in winter time from being reversed.

The prices of other varieties of frozen fish are also much less than those of the fresh-caught. Frozen western salmon runs from 6½ to 8 cents a pound wholesale, frozen bluefish from 9 to 15 cents, frozen pollock from 2 to 4 cents, and flukes from 2 to 5 cents.

RETAIL PRICES OF FISH.

The prices already discussed are wholesale prices. To them the retailer adds his margin of profit. That profit varies greatly according to the class of consumers. It is the custom for a host of peddlers in New York City to take zinc-lined baskets to the Fulton Market, buy their supply, and carry it to their districts, where it is distributed at minimum cost charges. The fish dealer in the residential districts, however, has a multitude of charges to be added, and he is also handicapped by the fact that his customers will buy only a few staple varieties, be they high or low priced. When some of the unknown varieties are offered to the housewife, because they are plentiful and oftentimes cheap, she declines to buy, first, because the low price indicates to her absence of quality, and, second, because she does not know the variety nor its palatability.

The prevailing ignorance concerning frozen fish is even greater than that concerning fresh fish. There is probably not one in ten thousand American housewives who would not refuse hard-frozen salmon at 15 cents a pound in favor of fresh-caught cod at 18 cents a pound. Yet most of them would doubtless consider salmon more or less of a delicacy.

Another difficulty in fish distribution is the relatively large sale on Fridays. The fishermen hold fish for the higher price of Friday's market, thereby losing the high quality so necessary if consumption is to be increased. The retailer does not

buy daily supplies for a continuous trade, as he does with meat, but lays in stock for Fridays only. Consequently, the housewife who would substitute fish for meat on other days, finds but scant choice unless she goes to the wholesale market.

The foreign-born population in the congested areas of our large cities are not prejudiced in favor of certain varieties; provided the price is within their means the name of the fish is a secondary matter. And if the fish is palatable the fact that it is hard frozen does not weigh against a low price. Consequently, we find hard-frozen whiting and other plentiful fish selling for a few cents a pound in inland towns as well as on the coast, when the shops in the residence districts are charging double the price for the same article thawed to simulate fresh-caught fish and sold as fresh, a condition directly traceable to the ignorance of the consumer.

PREPARATION OF FISH FOR THE TABLE.

The person who has enjoyed the appetizing and satisfying fish served so universally in Europe, or even in New Orleans, finds a woeful lack of ability on the part of the American cook to utilize to the best advantage even the high-class fish, and a hopeless incompetence when the less desirable varieties are used. The many attractive sauces that add flavor and piquancy are unknown. The many accessory dishes, such as salads, croquettes, patés, etc., that may be made from fish are never considered. A very great gain would accrue to this Nation if some agency would follow the example of Germany and institute classes in the art of cooking fish.

Fish is now the poor man's food in the United States. To it, more than to any other nitrogen-rich product, must we look for a food supply to supplement the meat which we can not hope to have in the future as in the past, either in price or in quantity. All food taken from the sea is a net gain to the land. This food in no way impoverishes the soil, and in fact adds to the fertilizing elements of the country. On the other hand, food raised on the land necessarily takes elements from the soil, and this tends to impoverish the fertility of our farms unless the elements withdrawn are artificially restored. This is true of every animal raised for meat purposes, although, of course, the depletion of the soil on which meat animals are fed is not so direct as when corn or some other

product is raised and shipped away to be consumed in some distant section. There is, moreover, a limit as to the amount that can be produced on the land. The fish in the seas, on the other hand, feed and breed unaided and practically in unlimited numbers. Like many another of our resources, we have not yet begun to fathom the value of the fish in our waters. Only time and necessity will teach what they mean to our Nation.

ECONOMIC WASTE FROM SOIL EROSION.

By R. O. E. Davis,
Scientist in Laboratory Investigations, Bureau of Soils.

IF you have ever been in a forest during a storm when the rain was coming down in torrents, you have probably ıoticed that the leaves and litter forming a layer on the urface of the soil act as a big sponge to soak up the water, nd not until great quantities have fallen do streamlets bein to appear from under this layer of humus. You have ıoticed also that the water in these streamlets, or even in a tream having its origin in a forest, is generally perfectly lear. Perhaps, on the other hand, it has been your fortune o observe the work of such a torrent in an open field with a olling surface. Here the result is quite different. With ıothing to break their fall, the drops of water strike the bare oil in quick succession. The effect is that of thousands of ttle hammers beating upon the soil; its surface is comacted, the grains are forced closer together, preventing the bsorption of water, and the finer material is so agitated hat it remains suspended in the water collected on the surace. Almost immediately streamlets form, and, unless omething impedes their progress, join together shortly to orm a muddy torrent. You may have observed these hings and understood perfectly well the reason for the diference in results in the two cases. But did it ever occur to ou that this difference is costing the United States millions f dollars yearly; that the amount of good soil material assing yearly to the sea by just such processes exceeds by nore than *two* times the total amount of material removed n digging the Panama Canal? If such are the facts, we hould study more closely the actual waste from water attriion and the means applicable for its prevention.

THE NATURAL PROCESS OF EROSION.

In the natural state, that is, the state in which the soil is overed with native vegetation, the soil is maintained in an

open, or porous, condition. Water from rain or melting snow is largely absorbed by the soil, passes down to deeper layers, and by seepage eventually comes to streams in the lowlands. But if the water is supplied to the soil more rapidly than the soil is able to absorb it, the collection on the surface begins to flow to lower levels. With leaves, litter, grass, or other vegetal coverings, the movement is retarded by the obstruction offered, as well as retained through capillary attraction on and between the surfaces of the material. In this way the velocity of the water over a vegetal-covered surface seldom attains such proportions that it is able to carry any great burden of suspended matter.

Hillside erosion is not a simple process, for in it are involved the relation of the velocity of moving water to the slope of the soil, the amount of organic matter incorporated in the soil, the vegetal covering, the mechanical composition of the soil, and the rate at which water is supplied to the surface. In addition to the surface conditions of the soil, the character of the subsoil has a profound effect upon the tendency to erode. Thus it comes about that two fields of the same slope may show a marked difference in the rate of erosion. The fact that a soil is or is not covered with forest or grass, or contains much organic matter, or is clayey or sandy, influences the rate at which it absorbs water and the amount of erosion caused by the surface run-off of the water.

ACTION IN FORESTS.

In forests the movement of water is slow, it does not collect into streams, and as a general thing erosion is almost negligible. These conditions are well illustrated in the southern portions of the Appalachian Mountains. Under the natural conditions of forest cover in those regions the rate of erosion is slow and there is gradually established a state of equilibrium in which the slope assumed becomes almost constant so long as the forest cover and the rainfall remain the same. A balance once established between the slope and the rainfall, the surface remains nearly the same for hundreds of years. Only occasional cloud-bursts or extraordinary rains produce a deepening of the valleys. The streams supplied by such slopes show marked characteristics. Only occasionally do they carry enough sediment to appear turbid, and even then

much of the suspended matter is organic in origin. The streams rise more slowly after storms, remain in flood for a longer period of time, and fall again more slowly than similar streams in cleared areas. Such streams have been described by the Geological Survey in the Appalachian Mountains in western North Carolina and eastern Tennessee. Cane River from Mount Mitchell and streams in the Toxaway section never become muddy, no matter how swollen from continued rains. Such streams maintain deep channels and have their beds over pebbles or bowlders. They seldom change their courses and are in equilibrium with the region, an equilibrium which is disturbed only on clearing the land, when the relation of surface slope to stream gradient is changed.

It is not uncommon in passing through the forests to find gullies started by the dragging or "snagging" of logs down the hills. Water accumulating in these smoother, bare places soon gathers momentum and sweeps soil and rocks down the slope with it. Often, however, erosion in a forest starts in the lowland or on the hillside adjoining the lowland. A region visited recently by the writer had a typical gully of such an origin. By undercutting and caving the gully has gradually eaten back into the forest until now it is more than 2 miles long and at its head nearly 60 feet in depth. It is not uncommon for it to advance 5 or 10 feet during an exceptionally heavy rainfall, carrying down the largest trees into its depth. (Pl. XXIII.)

The feeling one has on gazing up this yawning gulch is that only extraordinary means can stop its progress. And, indeed, this is true, for it has forced its way across roadways, through field and forest, right up to the front door of a dwelling. This, too, in a short time will be offered as a sacrifice to the ever-increasing appetite of this monster. While one of such gullies causes a feeling of wonder and disgust at the carelessness which permits a small wash, easily stopped in the beginning, to grow until it almost defies the ingenuity of man to check its progress, we can not fail to realize the enormous economic waste produced when in a ride of 5 or 6 miles eight or ten of those immense gulches are observed. Although really important in character, the peculiar soil conditions favorable to the formation of such gulches in the forest are rather exceptional. (Pl. XXIV, fig. 1.)

ACTION ON CLEARED LAND.

The greatest losses occur on cleared lands. In passing eroded sections one will notice the differences caused by the character of the soil and will naturally begin to classify the lands according to the character of erosion. In some regions it is possible to cultivate the soil on very steep hillsides without any washing. This security is often due to the mechanical composition of the soil. The soil is more or less of a permanently loose and porous nature and the water falling on it is practically all absorbed.

Other lands are subject to what is known as surface wash or sheet erosion, in which there is removed from every portion of the surface of the entire area an almost equal amount of soil material. This action is characteristic of close, heavy soils. Each heavy rain removes, as it were, a layer or sheet of soil material. Eventually this results in the appearance over the surface of the hillside of incipient gullies parallel to each other, often known as erosion of the parallel gully or shoe-string type. Gullies thus formed have sloping sides and more or less rounded edges. While the losses from this type of erosion are great, the result is hardly so disastrous, the devastation so rapid, or the possibility of reclamation so remote as in the case of the caving gully. (Pl. XXIV, fig. 2.)

The caving gully as described is the most destructive and the hardest to check. Its sides are almost perpendicular or slightly concave. The top layer of soil is generally of a heavy type which holds well, but, once a gully is started and this top layer is broken through, the underlying softer, micaceous or sandy layer is removed very rapidly, and caving results. (Pl. XXV, fig. 1.)

The rarest type of erosion is probably the landslide. Landslides occur generally where a thin layer of soil rests upon a glazy surface of rock.

RELATION TO LUMBERING.

The relation of erosion to lumbering is twofold. Much of the erosion in forests is started by the careless handling of cut timber, but a second and more serious result is that much of the land is destroyed even for future forest. Often the lumberman has cut away all timber, using what he could

and destroying what could not be used. On a recent visit by the writer to a sawmill situated in a section very subject to erosion, the owner was found to be entirely indifferent to any effects of his lumbering operations other than the amount of lumber that could be produced. In a near-by field, where the entire forest growth had been removed, great gullies had appeared and had ruined the field for agricultural purposes. (Pl. XXVI, fig. 1.) One of the gullies was followed for over a half mile to a bottom along a creek bed. This originally had been a fertile field, but now was covered in most places with sand from 1 to 3 feet thick. The state of this field may be judged from an accompanying photograph. (Pl. XXV, fig. 2.) When the owner was asked regarding his treatment of the land, he remarked that all he expected to get from it was the lumber. When asked if he expected to sell the land, he replied he did not suppose he could; "didn't think it worth anything as farm land, it washed so bad." And yet by the ruthless cutting of timber he was destroying its value either as forest land or for reforestation.

RELATION TO MINING.

The lumberman, however, is not the only person who is contributing to the devastation of land by soil erosion. The miner, too, though to a less extent, contributes something to this economic waste. In some sections, through the complete destruction of forest in order to obtain timber for mine construction, erosion has resulted. In other sections placer mining has indirectly induced erosion on hillsides and filled channels of streams with the material washed from the hills. Following certain mining industries a secondary effect produced is the destruction of near-by vegetation and the resultant devastation from erosion on the bare hillsides. Such results follow notably the mining of copper. An example is found in the Ducktown area of Tennessee.

RELATION TO POWER DEVELOPMENT AND NAVIGATION.

The losses from the filling of stream channels and storage reservoirs secured by building enormous dams can be touched on only. In many places the sediment collects so rapidly that the maintenance of storage reservoirs has been found impossible, and the practice of keeping simply a channel open

has been adopted. This means a great loss in water power and in navigation. In the rivers of the Southeastern and Southern States this constitutes one of the serious difficulties in the development of power sites. Owing partly to the fact that practically the whole precipitation both in the valleys and at the headwaters of these rivers is in the form of rain, and partly to the soil conditions, the rivers in general carry a large burden of sediment. Storage reservoirs are impossible because of rapid filling, and where dams are built for the development of power the reservoirs thus formed are also rapidly filled. W. S. Lee testified before the Agricultural Committee of the House of Representatives in 1908 that the capacity of certain reservoirs on the Catawba and Broad Rivers in South Carolina was so reduced that in a few years only the flow of the rivers would be available. At some sites dredging has been resorted to, but in general this has been found so expensive that finally no effort has been made to dredge more than enough to keep the stream channel open.

Many river bottoms fill so rapidly that continual dredging is required to maintain channels sufficient for navigation. The waters coming from the hills bring with them a burden of silt and other solid material in suspension which is deposited in the bed of the stream as it nears or reaches its flood plain. To prevent the filling of the stream bed and keep it open to navigation dredging must be continually resorted to. Otherwise the formation of sand bars and the change in the position of the channel are a constant menace to navigation. The Geological Survey reports the amount of silt carried by the Hudson River as 240,000 tons a year; by the Susquehanna, 240,000 tons; by the Roanoke, 3,000,000 tons; by the Alabama, 3,030,900 tons; by the Savannah, 1,000,000 tons; by the Tennessee, 11,000,000 tons; and by the Missouri above Ruegg, 176,000,000 tons.

RELATION TO AGRICULTURE.

Important as all these losses are, they are small in comparison with the losses to agriculture and to the soil itself. To appreciate the intrinsic value of soil we should consider its nature, how it is formed. Ordinarily we do not think of rock and soil as the same, and yet in composition they are

FIG. 1.—EROSION IN PASTURE RESULTING FROM DESTRUCTION OF GRASS COVER.

FIG. 2.—EROSION IN ORANGEBURG CLAY LOAM.

FIG. 1.—EROSION IN COASTAL PLAIN UPLANDS.

FIG. 2.—EROSION IN CLARKSVILLE SILT LOAM.

FIG. 1.—EROSION IN CLAY LOAM WITH SANDY SUBSOIL.

FIG. 2.—BOTTOM LAND RUINED BY SAND BROUGHT DOWN FROM NEAR-BY HILLS.

FIG. 1.—EROSION IN SANDY LOAM.

FIG. 2.—EROSION FOLLOWING ABANDONMENT RETARDED BY NATURAL GROWTH OF PINE, SHRUBS, AND GRASSES.

very similar. If we were to take rock and break it into many fine pieces, some of it to powder, we should change the character of the material but not its composition. This is partly what happens to form soil. In addition, the disintegrated mass is acted upon chemically by air and water, producing the weathered product we call soil. But that the freezing and thawing or changes in temperature, the action of water and of air should produce this material from rocks, requires, as may readily be imagined, a very long time. It is estimated that hundreds of years are required for the formation of an inch of soil. Considering the rate at which soil is formed, is it not criminal to allow its abuse and destruction? The result of one hard rain may remove the soil nature has prepared through centuries, much of its material being carried out to sea. Whenever the soil has been removed down to the underlying rock, it can not be replaced except by artificial means.

Under the original process of nature the soil was continually wearing away on the top, but more was forming, and the formation was somewhat more rapid than the removal. The layer of soil on hillsides represented the difference between the amount formed and that removed. After clearing, the rate of removal is greatly increased, but the rate of formation remains the same. Special means should therefore be adopted to prevent this removal of excess material.

Perhaps the power of water to remove this mantle of soil may be more clearly shown by a consideration of the great depth to which some rivers have cut. The Columbia River and the Colorado River have cut gorges 2,000 and 5,000 feet, respectively. Where the material is loose and incoherent the results produced by running water are much greater. It has been estimated that the Mississippi River, which drains over one-third of the area of the United States, delivers to the Gulf of Mexico from 370 to 680 million tons of suspended material yearly. Accepting the lower figure and assuming a lower rate for the rest of the United States (500 million tons), the total amount of soil material carried to the seas amounts to 870 million tons a year. Assuming that one-half of this is unnecessary waste, there is an annual loss of over 400 million tons of soil material. This means a

preventable waste yearly of more material than was removed in digging the Panama Canal. But this is only part of the story, for only a small portion of the soil brought down from the hills is carried to the mouths of the rivers. What proportion it is impossible to estimate.

Assuming an average removal of 3 inches from the top, or 500 tons per acre, this lost material would mean 800,000 acres ruined, which at a very low average loss of $5 per acre in value to the land would mean $4,000,000 per annum in depreciation alone.

An estimate of the solid material carried by the Potomac River places the amount removed at 400 pounds per annum for every acre drained by it. The James River, with a flood of 10-foot crest, is reported to remove 275,000 to 300,000 cubic feet of solid material in 24 hours and yearly removes three to four million cubic yards from the hills above Richmond in Virginia. The amount removed by erosion from the Piedmont region of North Carolina is said to amount to $3 per acre yearly in decrease in crop value alone, making a total loss in this region of over $2,000,000. The value of the soil itself, washed away, is small in comparison with the loss in fertility, or from forced abandonment and idleness of land due to erosion. Land that should be producing is left idle, or is only slightly cared for, so that the returns each year become smaller, and abandonment follows. It is next to impossible to estimate the millions of dollars lost in this way each year. Some idea of the extent of this loss may be gained from the fact that the National Conservation Conference in 1909 reported nearly eleven million acres of abandoned farm land in the United States, most of it damaged and over one-third or about four million acres actually destroyed by erosion. At an average original value of $10, the loss amounts to $40,000,000. The loss from non-production is probably as much yearly. Added to this the losses to navigation and water power and in the expense of keeping open channels will almost double the amount, so that annually the United States is suffering the loss of seventy-five to one hundred million dollars through the agency of erosion.

UTILIZATION OF RAINFALL.

The problems existing in the relation of erosion to the various industries are all subsidiary to the problem of the utilization of rainfall. This is the key problem of the whole series, of which navigation is the last. As has been stated, the natural process involves the absorption of most of the water where it falls. The problem is then put up to each individual owner of land. The water falling on an acre may be turned to good, lost as it runs away, or doubly lost if it carries a burden of soil particles with it.

By having the soil in such condition that absorption is easy, a portion of the water passes down to the seepage water, carrying with it harmful soluble materials; a portion returns to the surface to feed the plants, and a very small portion perhaps runs off the surface. There need be no uneasiness that too much water will be absorbed by soils where erosion is likely to take place, for in this country the crops can utilize all the rain during the growing season, and most of that falling at other seasons.

If the surface run-off is thus reduced to a minimum the water absorbed increases the fertility of the field and passes into the seepage water which emerges into the streams free from all sediment and suspended matter; river channels are not filled with sand, flood plains are not covered with gravel, reservoirs are not made useless, and the mouths of rivers are not filled up with fine silt. An observation of the extent to which absorption will take place was made following a rainfall of over an inch. On an uncultivated soil the water had penetrated less than 2 inches, while on a cultivated soil well supplied with organic matter the water had penetrated to 6 inches. On the soil not in condition to absorb the rainfall more than three-fourths had been lost in the surface run-off.

NATURAL RECOVERY FROM EROSION.

It is true that nature generally adapts itself to changing conditions, and for this reason a field abandoned because of erosion soon shows these efforts of nature to prevent the devastation. Volunteer trees spring up in the ditches, and briers cover the sides of the gullies. These, by the spreading of their roots and the addition of small amounts of organic

material to the soil, furnish a lodging place for detritus and slowly check the devastating work of the running water. (Pl. XXVI, fig. 2.) The process is very slow, however, and, while it may be possible to have a field reclaimed in this way, it is the slowest method, and one that permits of great waste during its accomplishment. (Pl. XXVI, fig. 2.)

This natural growth often furnishes a clue to the best method of reclaiming through reforestation. From the character of the natural growth, the kind of trees and shrubs best suited to the purpose can be determined. In one of the States having a section so subject to erosion that the State officials have become aroused to the danger of losing much of the land, the problem of reclamation has been seriously attacked. With a forester, especially selected for the purpose, working with the State geologist and the soil experts, it is hoped that lands that offer no hope of agricultural profit may soon be reforested, that proper methods of preserving the present forests may be introduced and the agricultural lands protected.

The natural reclamation of flood plains covered with sand can be accomplished slowly, but only after the cause, the erosion on the hillside, has been stopped or largely checked. If the velocity of the water from the hillsides be reduced the sand will be deposited before reaching the bottom lands and only the finer material will reach the plains. In times of flood the stream overflowing the plain will deposit a layer of silty material, and eventually a soil may be built up that is capable of use agriculturally. However, of all lands damaged by erosion, perhaps it is hardest to produce productive soil on lands that have been covered to some depth with sand.

RECLAMATION.

Many farmers when approached on the subject of erosion show interest and agree that the loss is great. They will say, "Why, yes, some of my fields are badly washed, but it doesn't pay to try to do anything with them." They expect reclamation, if it is ever accomplished, to be undertaken by the Government, and it is only with difficulty that they can be induced to make an attempt at stopping the ravages of erosion. It has been cheaper in the past to move to newer

FIG. 1.—TERRACED SLOPE.

FIG. 2.—A WELL-TERRACED FIELD.

FIG. 1.—POORLY KEPT AND BROKEN TERRACES.

FIG. 2.—A SYSTEM OF MANGUM TERRACES.

lands. But with the increased value of lands the necessity of utilizing that already in their possession will be impelling.

Any reclamation will employ the same principles that must be used for *prevention.*

Take as an example of the profit in reclaiming eroded land a place west of Johnson City, Tenn. Two years ago it was badly eroded, with several gullies 2 to 12 feet deep. The present owner paid $53 an acre for 38 acres, when adjoining land was selling at $100 to $150 an acre. The purchaser filled in the gullies with débris and by back-furrowing until no sign of them was left on the fields. He then incorporated much organic matter into the soil by putting on 200 loads of stable manure. Then by plowing the entire field to a depth of 10 inches it was put into such condition that practically all rain falling on it was absorbed. A crop rotation of rye, peas, and corn or wheat was adopted. Before the end of the second season $100 an acre had been offered and refused. The total cost of reclaiming the 38 acres—an accurate account was kept—was $376, or approximately $10 an acre; but the value of the land had increased $47. This particular soil is of heavy cohesive type and the erosion is not especially difficult to control, the incorporation of organic matter and deep plowing generally being sufficient to prevent gullying of its surface. This method is the most obvious one for preventing erosion.

The forest has been cut from some soils that should never have been deprived of their original growth. As a result, in some sections the devastation has been almost unbelievable, and the only possible way of reclaiming the soil or preventing much greater depredation is by reforesting. The type and kinds of trees best suited to this work in the various localities must be determined by the forester. This in many cases will be the best way of reclaiming eroded lands, even though it be possible to utilize them for agricultural purposes.

METHODS OF PREVENTION.

Of course it is much better to prevent the destruction of soil by erosion than it is to take eroded and worn-out land and attempt to reclaim it. The methods of prevention must be practiced in reclamation also, in order to prevent months' work from being lost through the agency of one hard rain.

In general there are two classes of methods employed. Those of the first class increase the porosity of the soil, enabling it to absorb a greater proportion of the water falling on it, while those of the second class decrease the velocity of the surface run-off. Increase in porosity is accomplished by the incorporation of organic matter in the soil and by breaking the soil to considerable depth. A reservoir is thus formed for the storage of water during times of storm. Deep plowing is being supplemented considerably by the use of dynamite for breaking up the subsoil layers. Deep plowing alone is not so beneficial as when used in conjunction with the incorporation of organic matter in the soil. The organic matter causes the particles of soil to granulate, thus leaving larger spaces between them. And it increases not only the absorptive capacity but also the water-holding power of the soil.

The second class of methods is composed of those that place some impediment in the path of the surface run-off. All kinds of terraces belong to this class. (Pl. XXVII.) A distinct prejudice against terraces exists in some sections where erosion is bad. Yet the beauty of a well-terraced field is only slightly less than that of a field with check rows. That there exist some disadvantages in the terrace, or hillside ditch and terrace, is readily admitted. The main one is connected with the use of harvesting machinery. However, when asked why he does not terrace his fields, the farmer has most often replied, "It wastes too much land." Perhaps he does not consider it wasted to have each year the best of his surface soil removed and deposited at the mouth of some river, hundreds of miles away. Any comparison on this basis is decidedly in favor of the terrace. It is mainly a question of whether we will retain for use part of the land or lose it all. If you doubt this, visit some of the sections where erosion is difficult to control. There you will find farms abandoned from one cause, namely, the terraces were allowed to break down. (Pl. XXVIII, fig. 1.)

There has lately come into prominence a terrace designed to eliminate the bad qualities and retain the good ones of the old-style terrace. This is the Mangum terrace, first constructed by Mr. P. H. Mangum, of Wake County, North Carolina. Its construction has been described often, so that

it will be described here only briefly. The Mangum terrace is a broad bank of earth with gently sloping sides contouring a field at a grade of approximately 1½ inches to 14 feet. The most ordinary way of constructing it is by back-furrowing along the grade lines, although a road scraper or other means may be employed. The Mangum terrace is well adapted to most types of soil suited to agricultural uses, especially where the land is moderately rolling. The effect of such a terrace is to give a gradually sloping side, both above and below its highest point, so that cultivation may be carried on right across the ridge in any direction. (Pl. XXVIII, fig. 2.) It also permits of the use of machinery, designed for extensive cultivation, and accomplishes the saving of considerable labor. While providing the same protection as the old-time terrace, it eliminates the waste of land and the breeding places for insects afforded by the weeds or grass growing on the ridges. For soils of a clayey or loamy nature it furnishes the ideal terrace.

Another method that has merit but is expensive is that devised by Mr. John A. Adams, of Johnson County, Missouri. His method is to build across the lower part of his field a dam of earth or stone, which would stop the surface run-off and hold it on the field. But the distinctive thing about the plan is the way in which storm waters are cared for. Passing through the dam is a sewer pipe connected on the upper side with an upright pipe. The water runs down and fills the valley until it reaches the height of the upright pipe, when it flows down into the next field. The water left standing below the mouth of the upright pipe is disposed of by a tile drain laid along the valley and passing to the sewer pipe. The result of the system is that the rushing water is checked in the valley and gives up its burden of sediment, the water is removed from the valley largely by seepage into the tile drain, and the ground remains in good condition for working.

Other types of terraces are in use, and many modifications are often adopted to suit particular kinds of soils.

In some sections, and suited to certain uses, a combination of the two methods of prevention is employed. Strips of grass maintained between strips of equal width growing some cultivated crop afford a protection that is adequate if the soil does not show too great a tendency to wash. In orchard culture often a sod mulch is maintained upon the

ground, one of its purposes being to prevent the erosion of the soil.

Methods of prevention have not been widely employed in this country. In China, where lands have been used for agricultural purposes for centuries, the terraces have been developed with great care, and the tilling of the soil has been pushed far up on the steep hillsides. Terraces are often formed by the use of retaining rock walls on their lower sides. Similar methods are used in Europe to allow cultivation of steep hillsides. However, in this country it will hardly become necessary for some time to resort to such expensive methods to save the lands. If taken in time the waste of the less steeply situated land may be saved by some of the simple methods mentioned.

Methods of preventing stream erosion consist mainly in maintaining deep, clean stream beds, and if the headwaters are properly taken care of it should be no great task to control the stream in the plains. At times the character of the soil along the banks is such that there is a continual undermining and cutting of the banks. A protective wall may be the only remedy, though often willows or other quick-growing plants may afford protection against erosion. In some sections of Europe, where the headwaters of the streams are looked after with great care, the whole bed of the stream in its upper course may be found lined with brick and built in regular terraces. The erosion of the stream is prevented near its source, and the filling of the stream bed near its mouth is avoided.

From this survey of the economic aspect of erosion it is readily seen that the fertility of the fields in many hilly sections is being reduced by the bodily removal of the soil material, resulting in an annual loss of millions of dollars in crop production. Further losses are entailed in manufactures, power development, navigation, and other industries. The retention of the water where it falls would also prevent many destructive floods. The only way to stop the enormous waste is for each farmer to prevent erosion on his land. That reclamation even is profitable has been shown. Public sentiment should be aroused against the carelessness or indifference which permits eroded hillsides.

THE GRAIN SORGHUMS: IMMIGRANT CROPS THAT HAVE MADE GOOD.

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INTRODUCTION.

THE world is being searched for new plants for the American farm and garden. Some of those introduced in comparatively recent years have become staple and valuable crops. Among these are durum wheats, Swedish Select and Kherson Sixty-Day oats, and others. We call them no longer foreigners but Americans. Other introductions which now seem strange and new will become familiar in the next decade or two. Many others will never become known because they are not adapted to our environmental or economic conditions.

The grain sorghums are rather stout and mostly tall plants of the grass family, distantly related to corn. The grain is not found in ears, for they have none, but in heads which they bear where corn carries its tassel. There are several groups of these grain makers, known by different names. Among them are the durras, including feterita, and the milos, which have mostly short, fat heads and large flat seeds; the stout, broad-leaved kafirs, which have longer heads, full of small, egg-shaped seeds, and the slender, dry-stemmed kaoliangs with mostly small, oval seeds borne in heads of various shapes.

While not of wide adaptation under present conditions, the grain sorghums are so perfectly adapted and so evidently supreme in their particular domain that they achieve an importance in excess of their statistical rank as farm crops. To those who wonder why their use has not developed more rapidly, in view of their proven value, it can only be said that changes in crops or cropping methods must necessarily be slow. Progress must be measured not by years but by decades if stability of production is to be assured. Farmers are confessedly conservative. It is well. Were it not so the world might face famine as often as business faces panic.

IN THE ANCESTRAL HOME—USERS AND USES.

Wherever the white man's love of adventure and discovery has led him, he has always found primitive peoples using strange new plants for food. The early explorers and colonists of America found the Amerinds cultivating maize and the native Indians of the Titicaca plateau in Peru, at elevations of 11,000 to 14,000 feet, making use of quinoa, a kind of lamb's-quarter (*Chenopodium quinoa*). The traders and adventurers who first touched India and China gained their principal impressions from the port cities and recorded that the people of those countries lived chiefly on rice, a fiction that still persists. Later travelers, who reached the interior, found wheat, sorghums, and millets to be staple articles of diet. The sorghums were used mainly by the poorer classes or in times of scarcity.

In India the two large southern presidencies, Bombay and Madras, nearly 1,500 miles long and half as wide, are the best-known areas of sorghum production. The crop is important, however, in the States lying farther to the north. It was estimated a few years ago that the area annually devoted to sorghums in India was 25,000,000 acres. More than 300 varieties have been imported from there and grown by the United States Department of Agriculture. A great diversity of forms was found, the plants varying from dwarf and stocky to tall and slender (Pl. XXIX, fig. 1) and the heads having as wide a range of variation. Some curious varieties were found, having two seeds in each spikelet instead of the customary one, a phenomenon occurring regularly in occasional spikelets of cultivated sorgos in this country. Other forms had long and pointed glumes, like the hulls of oats, projecting far beyond the apex of the seed.

In China, Manchuria, and Chosen (Korea) a distinct group of grain-producing sorghums, the kaoliangs, have been developed (Pl. XXIX, fig. 2). They range from Yunnan, on the mountainous frontier of Tibet, to far Manchuria, a stretch of more than 2,000 miles. Dwarfs less than a yard in height and slender sapling stems 20 feet or more tall are found (Pl. XXIX, fig. 3). Between these are all the intermediates one might well expect. In head forms and seed colors the gamut is equally complete.

It is among the frugal and industrious Chinese and Manchus that the grain sorghums are put to the most varied

uses. Besides the meal and porridge made from the seeds and the fodder derived from the whole plant, the thrashed heads are used for fuel and certain sorts for brooms; the leaves are used for fodder and for mats; the stalks for baskets, light bridges, fences, fuel, hedges, house-building material, kite frames, laths, matting, playthings, posts, thatching, trellises, windbreaks, withes, and window shades, while even the roots and attached stubble are carefully dug and saved for fuel. The seed is also commonly used to make a fermented drink, or beer.

When we survey Africa, however, the real abundance and diversity of the cultivated members of the sorghum family are seen. They are found in every nook and corner of the great peninsular continent. Five thousand miles from northern sea to southern cape she lies, and 4,000 from ocean to ocean. From Morocco to Egypt, from Egypt to the Cape; again from the Cape northward to the old Slave Coast; and throughout the length of the Sudan, from Senegal on the west to Abyssinia on the east, this crop occurs. On the dry plains, in the oases of the Sahara, on high plateaus, and in mountain valleys, in tropical jungles and temperate veldts, throughout the length and breadth of Africa, sorghum is the one ever-present crop, though the forms are as diverse as the conditions under which they grow. The plants vary in height from 3 or 4 to probably 20 feet (Pl. XXX, fig. 1). The heads vary in shape and structure from ovate and densely compact to loosely cylindrical, to fan-shaped forms, and to long and flowing feathery plumes. In length they vary from 5 to 25 inches. The seeds vary in color from white to pink, red, brown, and yellow, with an occasional tinge of blue. Everywhere they are used by the native tribes for human food, for the making of fermented drinks, and as fodder for live stock where such is owned.

IMMIGRANTS IN A NEW COUNTRY.

THE DURRAS.

In 1874, two durras, Brown and White, arrived at the port of San Francisco, though whether by first cabin, second cabin, or steerage is not recorded. Their passage had been booked from Egypt, but it is now known that their African home was in the old Barbary States of Algeria and Tunis and in the oases of the Sahara. Out to the ranches in the

two great inland valleys of the State they went and proved their entire ability to withstand the far-famed California climate. During the next few years they were allowed to occupy the wide space between rows of young grapes, almonds, and plums until it was needed by the growing fruits. In return, they fed the rancher's work stock, cows, and chickens.

THE KAFIRS.

While this little foreign colony was being planted in California, something was doing on the Atlantic coast, 2,500 miles away. In the year 1876 a great international exposition was held in Philadelphia to commemorate the hundredth anniversary of American independence. Among the many foreign exhibits at the Centennial Exposition was that of the Orange River Colony, later known as the Orange Free State, and now a part of the great Union of South Africa. In this exhibit were two samples of small, hard, egg-shaped seeds, one white, the other a red-brown (see Pl. XXXI, fig. 1, *C* and *D*), two varieties of the so-called "Kafir corn" (Pl. XXX, fig. 2) of South Africa.

How slender is the chain which connects these two samples of seed lying in a Philadelphia exhibit with the thriving industry of the dry-land West! Probably hundreds and thousands of visitors looked at the strange new seeds and thought no more of them, or noted only that they were sorghums from South Africa, whence had come, some 20 years before, the sorgos or sweet sorghums which America still hoped would one day fill her sugar bowl. Of all these sightseers, only two, so far as we have any record, were interested enough to ask for samples. Perhaps these two had come in touch at Philadelphia who knows? One was a Georgia planter, Mr. J. A. Meeker, of Marietta, who took the seeds home and grew the plants for a few years, but finally lost his stock of seed by mice and rats. The second was an English officer from Egypt, said to have been a Gen. Graves, who traveled through the South after visiting the exposition. He left a very small quantity of the white seed at the Georgia State Department of Agriculture, during his stop in Atlanta.

On February 14, 1877, a thimbleful of the seed was sent by Dr. T. P. Janes, then State commissioner of agriculture, to Dr. J. H. Watkins, of Palmetto, Ga. For eight years, from 1877 to 1884, he grew it, selected it, and increased his

FIG. 1.—PLANTS OF DIFFERENT VARIETIES OF SORGHUM FROM INDIA.

(Photographed by author.)

FIG. 2.—FIELD OF KAOLIANG CURING IN THE SHOCK, HARBIN, MANCHURIA.

(Photographed by Frank N. Meyer.)

FIG. 3.—FIVE VARIETIES OF KAOLIANG.

Left to right: C. I. No. 273 (S. P. I. No. 21078), Valley Brown; C. I. No. 293 (S. P. I. No. 22011), Shantung Dwarf; C. I. No. 309 (S. P. I. No. 22911), Valley Brown; C. I. No. 272 (S. P. I. No. 21077), Mukden White, C. I. No. 310 (S. P. I. No. 22912), Barchet Blackhull. (Photographed by author, 1908.)

FIG. 1.—PLANTS OF TWO ABYSSINIAN SORGHUMS.

S. P. I. No. 11084, tall and still growing, September 26, 1906, and S. P. I. No. 11082, 3 feet tall and in fruit, September 16, 1905. (Photographed by author.)

FIG. 2.—HEADS OF FOUR VARIETIES OF KAFIR.

A, White kafir; *B*, Guinea kafir (Guinea corn of the West Indies); *C*, Blackhull kafir; *D*, Red kafir. (About one-fifth natural size.)

FIG. 1.—SEEDS OF GRAIN SORGHUMS.

A, Milo; *B*, White durra; *C*, Blackhull kafir; *D*, Red kafir; *E*, Brown kaoliang; *F*, Shallu. (Slightly reduced.)

FIG. 2.—PLAT OF DWARF MILO, SHOWING PENDENT (GOOSENECKED) HEADS.

(Photographed by author.)

FIG. 1.—THREE PLANTS OF BLACKHULL KAFIR, 5.5 FEET HIGH, SELECTED FOR LOW STATURE AND HIGH YIELDING POWER.

(Photographed by author.)

FIG. 2.—ORIGINAL PLAT OF DWARF AND EARLY BLACKHULL KAFIR (C. I. No. 340.)

(Photographed by author.)

stock of seed. In 1885 and 1886 he began to distribute it personally and through the Georgia State Department of Agriculture, and in 1886 through Hon. Norman J. Colman, United States Commissioner of Agriculture.

THE MILOS.

Just at the time the White kafir was being sent out on its first missionary journeys to the dry-land West, there appeared a new sorghum immigrant in the South. It was first brought to notice in South Carolina, but no one knows just when or whence it came. Almost certainly, however, it arrived from Africa, and perhaps as a stowaway. Relatives have since been found in irrigated Egypt, but the same plant has not again appeared. In this country it was first known as "yellow millo maize." The crop most commonly known at that time as "millo maize," however, was a white-seeded variety (see Pl. XXX, fig. 2, *B*) from the West Indies, called there "Guinea corn" by the English and "petit millet" by the French. The yellow-seeded immigrant never became well known in the South, but was carried westward early by emigrating planters and soon became established in Texas.

FIGHTING DROUGHT ON THE PLAINS.

While the immigrant crops already described were finding place in the older settled States, the thin skirmish line of pioneer farmers had been thrown far out into the Great American Desert. These were followed closely by the larger army of settlers seeking homes on the newer, cheaper lands of the West.

Kansas bore the brunt of the battle against the desert. Oklahoma was largely closed to settlement until 1890, and much of western Texas was occupied and dominated by immense cattle ranches. Within the borders of Kansas, however, the influx of settlers was very rapid. The population increased more in the three years 1871–1873, inclusive, than in the entire decade previous. This was due partly to the early history of the State, partly to encouragement given to settlers by State agencies, and partly because of the early building of two transcontinental railways across the Commonwealth.

Settlers from the older and more humid States, good farmers under the conditions with which they were familiar, poured out into the Plains area during the decade beginning

with 1871. The crop varieties used were those adapted to more humid conditions. The principles of dry farming were then unknown, and experiments to determine them were not yet begun.

Disappointment and discouragement awaited many of the new settlers, especially those in the farthest West. Climatic conditions were much more severe than they had experienced or expected. Years of deficient rainfall and drought occurred. Sometimes gales of wind in spring destroyed young crops and moved vast quantities of soil from the fields to fence rows, farmyards, and other drift-making shelters. Hot and scorching winds in midsummer sometimes blasted crops in a single day. Immense swarms of hungry grasshoppers moved to and fro during 1874, devouring growing crops almost in a night. They appeared again in some sections for periods of two and three years thereafter. These conditions, especially the destructive winds and recurring drought, were wholly new and strange to most of the farmers.

Successive periods of drought rolled back the advancing wave of settlement time after time, now here, now there, leaving deserted farms and ruined villages in their wake. Settlers surveying the grass-covered and flower-tinted prairies in the warmth and beauty of spring could not realize the pitiless sky and parched earth of many a midsummer. It seemed to them incredible that so fair a prospect could be utterly mocked by the lack of a few inches of rain. Nor was the advice given them always of the best. As late as the end of 1880, a year of great drought, Kansas settlers were assured by the then professor of meteorology at their State University that increased rainfall with increased settlement was practically a certainty. Doubtless he was misled by the unsuspected incompleteness of early rainfall records from frontier army posts and by a certain apparent periodicity of precipitation in that area. At any rate, most who heard believed, because it was what they wanted to believe. Bad as 1880 had been, 1881 was far worse. Corn was a complete failure in the western counties, and the average acre yield for the entire State was less than 20 bushels. The native vegetation of the Plains consists of types which can withstand such adverse conditions, through one adaptation or another. Manifestly farm crops and farm practices also must have special adaptations in order to be successful in such an environment.

NEW CROPS AND A NEW HOPE.

Under the conditions described, one may well believe that earnest search was made for adapted crops. Sorghums were quickly in the minds of many. Sorgos or sweet sorghums had been grown by the earliest settlers and their drought resistance proved. Were all sorghums drought resistant? No one knew, but plenty were willing to try. Out in California, the two durras, there called "Egyptian corn," had been found to grow well on dry farms. They were brought to Kansas in 1879 and in the years 1880–1882 over 30,000 acres were grown annually, after which their production declined. In spite of their ability to withstand drought, they were not profitable. Of low stature and scanty foliage, they yielded little fodder where fodder was greatly in demand. The heads were pendent and troublesome to gather. The grain also shattered badly in the field in windy weather and during harvest. So sorgos were grown for forage and the search for an adapted grain crop continued.

In 1885 Dr. Watkins and the Georgia State Department of Agriculture first began to distribute the White kafir, and in 1886 the United States Department of Agriculture took part in the propaganda. As soon as it reached the dry lands it was seen to be adapted to the conditions. By 1888 it was appearing on the farms of Kansas. It was as drought resistant as any sorghum in the peculiar ability to suspend growth through considerable periods of drought and to resume growth when favorable conditions were restored. The stalks were erect and leafy and remained green until the seed was ripe, thus making good fodder as well as grain. The seed remained firmly held in the glumes while the crop cured in the field, thus preventing any waste. Here was the ideal crop for the dry country. Farm settlement took a fresh start, and the new crop and the new farm developed together.

Data on the acreage of kafir were first available for 1893, when there were 47,000 acres in Kansas. The acreage increased 100 per cent annually for the next three years and continued to increase to the end of the first decade covered by statistics, reaching high-water mark at three-quarters of a million acres in 1902. This maximum followed the seriously unfavorable season of 1901, when corn was a total failure in the western sections and yielded little more than

6 bushels to the acre for the entire State. Two or three years more favorable to corn and the lack of a profitable market for surplus kafir then checked the increase for the next eight years. From 1903 to 1910 the Kansas grain-sorghum acreage varied between 530,000 and 740,000 acres annually. In Oklahoma from 1904 to 1910 the area varied between 390,000 and 685,000 acres, the maximum occurring in 1909.

Meantime chemical analysis had shown the grain sorghums (Pl. XXXI, fig. 1) to be very similar to corn in composition. Digestion trials and feeding tests had proved them to have 90 per cent of the value of corn for feeding purposes. A 10 per cent advantage in drought resistance and consequent average yield would make the grain sorghums equal to corn as farm crops. This advantage they had, and more. At the same time field experiments with these crops were showing the need of new theories to account for the behavior of different varieties under similar conditions.

RESISTING OR ESCAPING DROUGHT.

That sorghums of all kinds were drought resistant was very early apparent. That some sorts escaped from as well as resisted drought was slower to be realized. Such varieties as did best in dry seasons were thought to be more drought resistant in some way than other varieties. Gradually came a better knowledge of the movement and storage of soil moisture and of its transpiration by dry-land crops. It was seen that earliness aided a crop to escape drought by shortening the period during which water was required. Dwarf stature and small leaf area also helped to reduce the quantity of water needed in any given period.

Thus was recognized the existence and value of characters which enable drought-resistant crops further to escape and evade drought. Dwarf plants with small leaf area may escape drought when it occurs because they use the stored soil water more slowly than larger plants with larger leaf areas. Thus the stored supply may last until they are mature or until the drought is broken. Earliness aids the plant to evade drought by bringing it to maturity before the drought occurs or becomes severe. When these principles became fully recognized, the quest for dwarf and early strains was given a great impetus. The need of such strains

for use farther north and at higher elevations had been felt before. To this need was now added the equally pressing need for drought escapers.

BREEDING DROUGHT ESCAPERS.

The search for dwarf and early strains to meet these needs and conditions was begun promptly by the United States Department of Agriculture. While explorers ransacked the corners of the earth for desirable forms, breeding was commenced with the most promising material in hand.

A dwarf strain of milo (Pl. XXXI, fig. 2), its origin unknown, was already here, needing little improvement except in the matter of pendent heads. The White kafir as originally introduced in the Plains was fairly dwarf and early, but it had one serious defect, namely, the tendency of the heads to remain partly included in the boot. This must be overcome if it was to be of value. Dwarf strains and early strains of Blackhull kafir, the favorite crop, were yet to be created.

From the many strains of Blackhull kafir under test a large number of head selections were made from stalks having low stature (Pl. XXXII, fig. 1) and other desirable characters. In the summer of 1908 an extra dwarf row appeared in the series of dwarf selections. From this row was bred the Dwarf kafir (Pl. XXXII, fig. 2), now becoming so popular. It reaches a height of only 3 to 4 feet and matures 7 to 10 days earlier than ordinary acclimated strains of Blackhull kafir. It can thus be grown in a shorter season than other strains and is also more drought escaping. At the same time and from the same source was produced an early-maturing strain which retains the height of the ordinary kafir. In Plate XXXIII are shown the comparative earliness of the Dwarf and Standard Blackhull kafirs, growing side by side on the high plains of northwestern Texas.

In 1907 another immigrant came to us out of Africa. This time it was from the wild and turbulent region of the British Egyptian Sudan—from historic Khartum, where "Chinese" Gordon wrought and ruled and where he finally perished in the fanatical uprising that closed the Sudan for long and bitter years. This durra variety, known as feterita, or Sudan durra (Pl. XXXIV, fig. 1), is marked by erect heads, white seed, fairly dwarf stature, and early maturity. These are all desirable characters, and it gives promise of some

value as a dry-land crop. Just now enormously inflated values are being ascribed to it because in many cases it produced grain in 1913 when kafir and even milo failed. However, its larger, softer seed and somewhat weaker germination cause rather thinner stands than are obtained from kafir and milo. In the dry season of 1913 these thin stands were its salvation, as has been noted also in other seasons. What its permanent place and value shall be it is yet too early to predict.

It was soon found that the milos and durras could not be depended upon to furnish grain as far north as Nebraska and South Dakota. The heat units available, especially at night, seemed insufficient. Could sorghums be found which had acquired, through the centuries, that acclimation and adaptation to northern climates needed in this case? The southern boundary of South Dakota is in latitude 43° and the north line about 46°. The only region in the world which grows sorghums abundantly as far as 40° from the equator is Manchuria. Many varieties of the kaoliang from northern China, Manchuria, and Korea were obtained, tested, and classified. (See Pl. XXIX, fig. 3.) The earliest of all proved to be a plant of medium size from Manchuria (Pl. XXXIV, fig. 2), which was described and named Manchu Brown (C. I. Nos. 171, 261, and 328). While not a heavy yielder, it has consistently outyielded corn in the central part of South Dakota and is now being distributed to South Dakota farmers by the State experiment station and the United States Department of Agriculture.

MAKING GOOD.

During those years when the grain-sorghum acreage was increasing most rapidly, as also in the later 8-year period when it remained stationary, the area devoted to corn was steadily enlarged. Corn was king, his supremacy as yet unchallenged. To deny his royalty was treason. But the appreciation of kafir and milo as comparatively safe crops in dry seasons was increasing. So was the knowledge that corn was a doomed crop in a year of drought. Land sellers still said corn was the crop to grow; ergo, corn must be grown. But facts are stubborn things. The theory of increasing rainfall had long since been dried out of the most credulous minds. Empty pockets and empty stomachs speak louder than tongues and are far more efficient in opening eyes and dis-

arming prejudice. Promoters and growers alike began to see a great light. Reduction of the corn acreage was openly advocated. Farmers, farm papers, scientists, merchants, bankers, land men, and railroads all joined in an aggressive campaign to promote the growing of kafir and milo instead of corn in the drier Plains. In Oklahoma it was even seriously proposed that credit and loans be denied to any farmer not planting at least a certain acreage of kafir. Doubtless some foolish talk was indulged in and much foolish advice given during the campaign, but of the results there can be no doubt. There was a decided decrease in the acreage of corn and a comparatively enormous increase in the area devoted to grain sorghums.

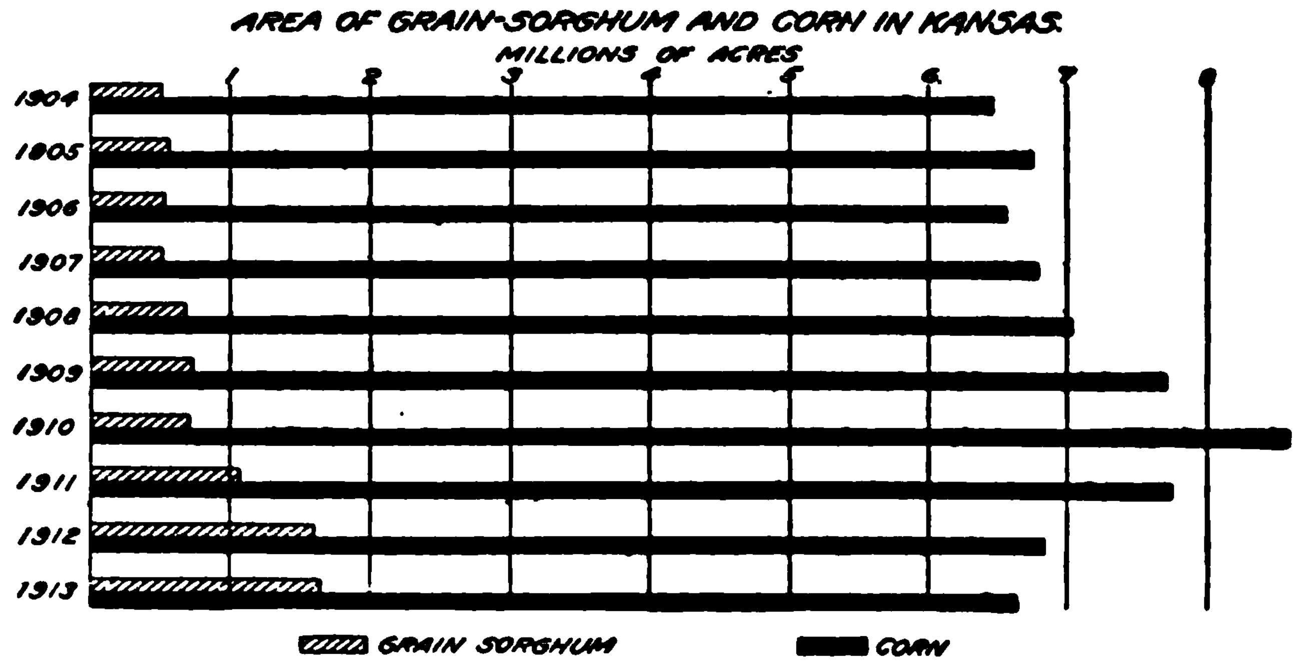

FIG. 5.—Graphic presentation of the comparative area in millions of acres of grain sorghum and corn in Kansas for the ten years 1904-1913, inclusive.

The coincidence of the declining corn area and the increasing acreage of kafir and milo in Kansas can be seen at a glance in figures 5 and 9. Figure 5 tells the story for Kansas as a whole and figure 9 for the 46 counties comprising the western half. In this State the grain-sorghum area jumped to 1,093,000 acres in 1911, 1,605,000 acres in 1912, and 1,633,000 acres in 1913. The maximum area devoted to corn in Kansas was 8,590,000 acres grown in 1910. In 1911 and 1912 the area decreased nearly 1,000,000 acres a year.

What caused the rapid change in comparative acreage? A growing knowledge of comparative acre values. Mere acres count for little unless they produce profits. Figure 6 shows the acre value of both crops in Kansas during the last 10 years. For the entire State the average acre value of

kafir and milo was $2.14 greater than that of corn. The production of these crops is also more regular and evenly distributed. These statistics, taken from the reports of the Kansas State Board of Agriculture, are not wholly fair to corn, however. They include the value of both grain and stover in grain sorghums, but only the grain value of the corn. If the stover value of corn were included the average values would be more nearly equal.

How nature helped to swing the pendulum is seen when corn yields are considered. For 1907 to 1909 the average yield in Kansas was only about 20 bushels per acre; in 1910 less than 18 bushels; in 1911 less than 13 bushels; in 1912 it

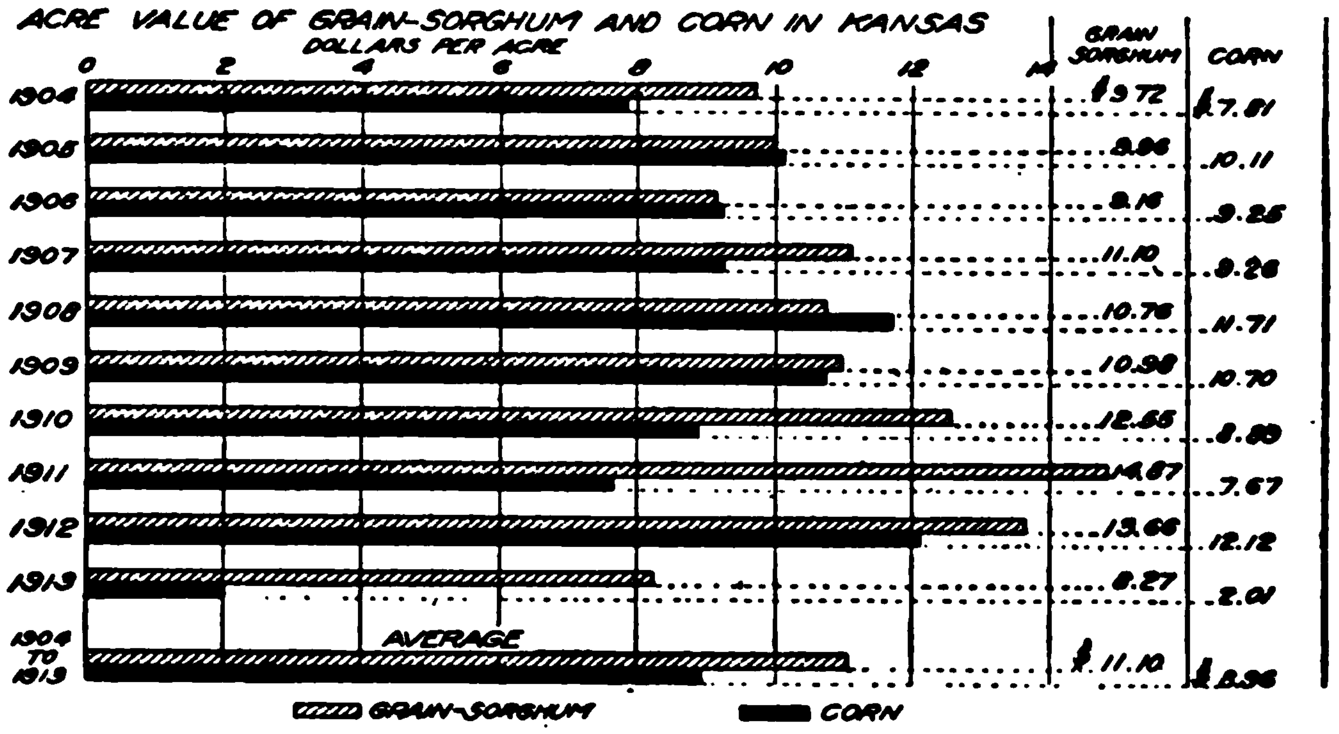

FIG. 6.—Graphic presentation of the annual acre value in dollars per acre of grain sorghum and corn in Kansas for the ten years 1904–1913, inclusive, and average acre value for the 10-year period.

increased to nearly 23 bushels, but in 1913 was only 2.75 bushels. It would be very interesting to compare the yields of grain sorghum and corn, but unfortunately statistics of the former are given in tons of crop and of the latter in bushels of grain.

While this was being done in Kansas, Oklahoma also was making history. Figure 7 tells the story of Oklahoma's acres, while figure 11 shows what happened in the 21 counties contained in the western third of the State. She produced 625,000 acres of grain sorghums in 1910 and 873,000 acres in 1911, an increase of a quarter million acres. No data for 1912 and 1913 are available, but there is every reason to believe, from the vigorous campaign waged, that the increase was proportional to that in Kansas. Oklahoma reached her maximum corn area in 1909 with 5,135,000

FIG. 1.—A PLAT OF DWARF BLACKHULL KAFIR (C. I. NO. 340), AUGUST 31, 1911.

Compare its earliness with that of standard Blackhull kafir (fig. 2) planted on the same day. (Photographed by author.)

FIG. 2.—A PLAT OF BLACKHULL KAFIR (C. I. NO. 71), AUGUST 31, 1911.

Compare the stage of development with that of the Dwarf Blackhull kafir in figure 1, planted on the same day in an adjacent plat. (Photographed by author.)

FIG. 1.—A PLAT OF FETERITA, SHOWING THIN STAND AND UNEVEN GROWTH.

(Photographed by author, August 31, 1911.)

FIG. 2.—PLAT OF SELECTED MANCHU KAOLIANG (C. I. No. 171).

(Photographed by author.)

FIG. 1.—MILO SEEDS, HULLED AND UNHULLED, AND A SMALL BRANCH OF A HEAD. (NATURAL SIZE.)

FIG. 2.—MILO FIELD IN SHOCK, XIT RANCH, CHANNING, TEX., SEPTEMBER 18, 1906.
(Photographed by author.)

FIG. 3.—FIELD OF MILO AS IMPROVED BY SELECTION, FROM 4 TO 4½ FEET TALL, SLENDER, WITHOUT BRANCHES, HEADS MOSTLY ERECT.
(Photographed by author.)

acres. In 1910 and 1911 the decline was at the rate of more than a million acres a year, as shown in figure 7.

Figure 8 shows the acre value of both crops in Oklahoma for eight years, beginning in 1904. Corn has an average ad-

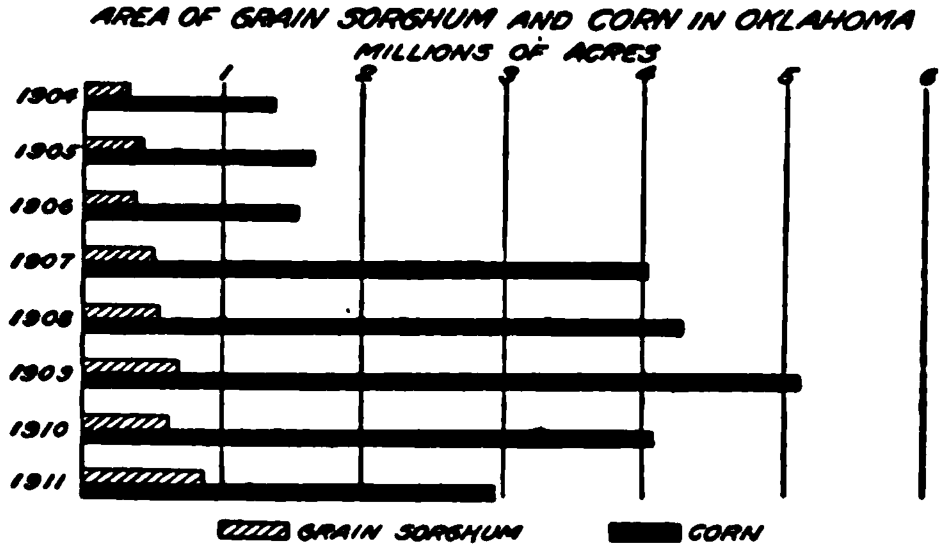

FIG. 7.—Graphic presentation of the comparative area in millions of acres of grain sorghum and corn in Oklahoma for the eight years 1904–1911, inclusive.

vantage of $2.26 per acre for the period. This reversal of the Kansas figures is due to three or four things which profit corn. Oklahoma lies in a more southerly latitude than Kansas. The Oklahoma statistics include the stover value of only a small part of the grain sorghum. The grain sorghums are largely restricted to the drier western third of Oklahoma. (See fig. 11.) The very unfavorable season of 1913 is not included, for lack of data.

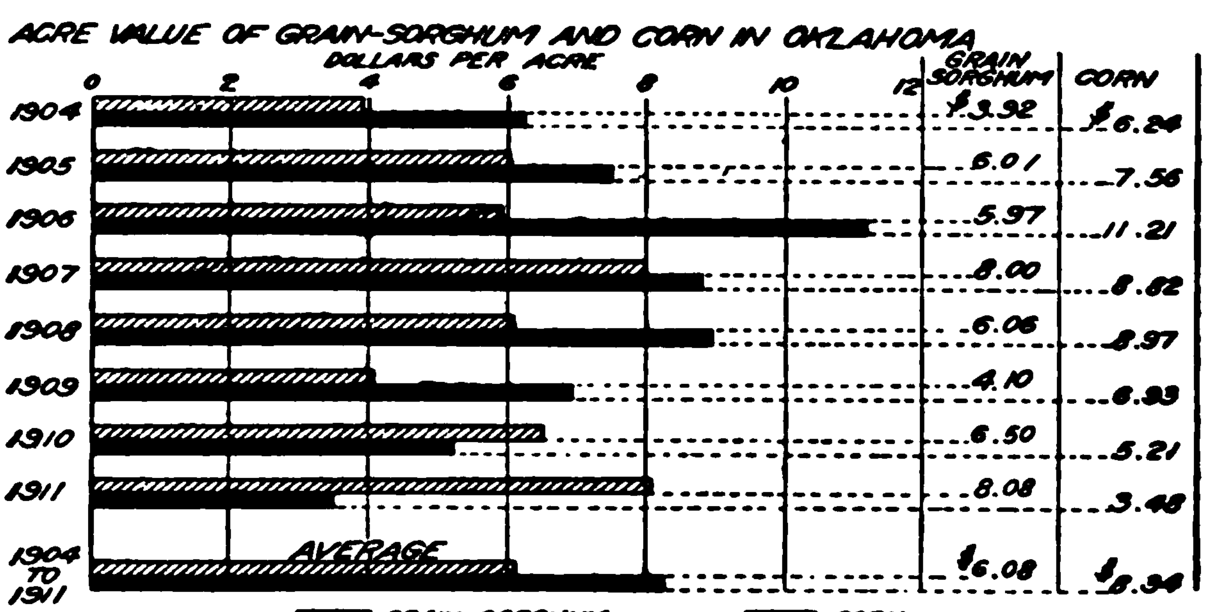

FIG. 8.—Graphic presentation of the annual acre value in ollars per acre of grain sorghum and corn in Oklahoma for the eigh years 1904–1911, inclusive, and average acre value for the eight-year period.

In Oklahoma the average yield of corn in 1907 and 1908 was less than 19 bushels; in 1909 less than 14 bushels; in 1910 less than 12 bushels; and in 1911 little more than 6 bushels. Statistics of production for 1912 and 1913 are not available, but it is certain that the average yield in 1913 was very small. Such yields for the entire State usually mean

almost complete failure of corn in the western portions. The actual annual yields of the grain sorghums would be very desirable here, also, but a portion of the crop is reported in

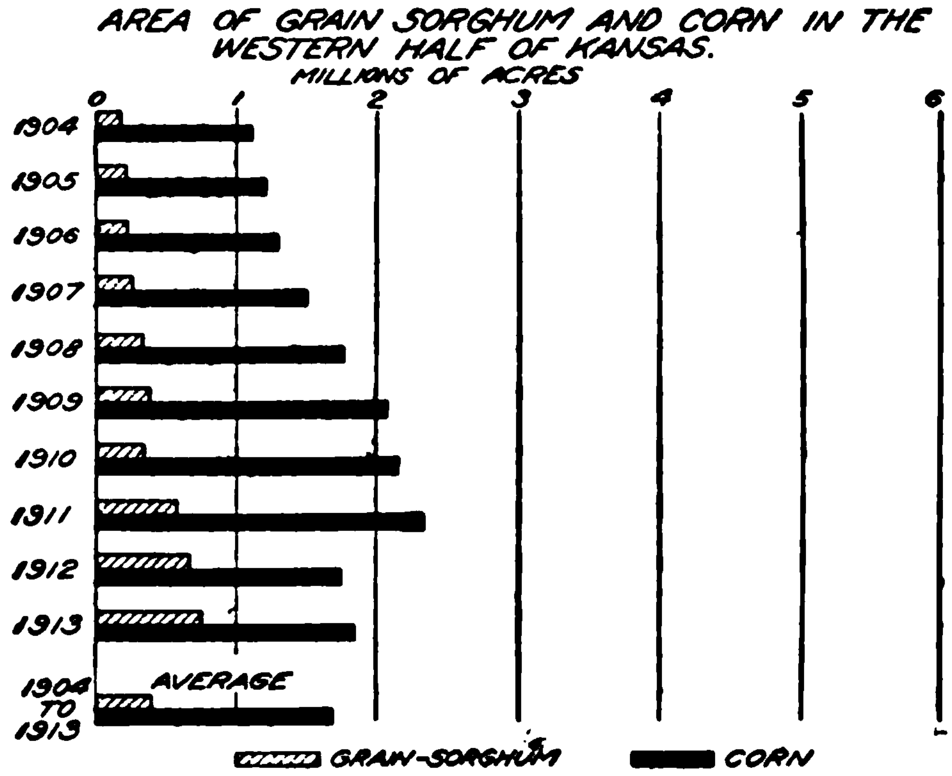

FIG. 9.—Graphic presentation of the area in millions of acres of grain sorghum and corn in the 46 counties comprising the western half of Kansas and lying wholly west of the ninety-eighth meridian, for the 10 years 1904–1913, inclusive, and average area for the 10-year period.

bushels of grain and the remainder in tons of crop and the acreage is not separated.

Where then should kafir and milo be grown in preference to corn? Figures 9, 10, 11, and 12 assist in answering this

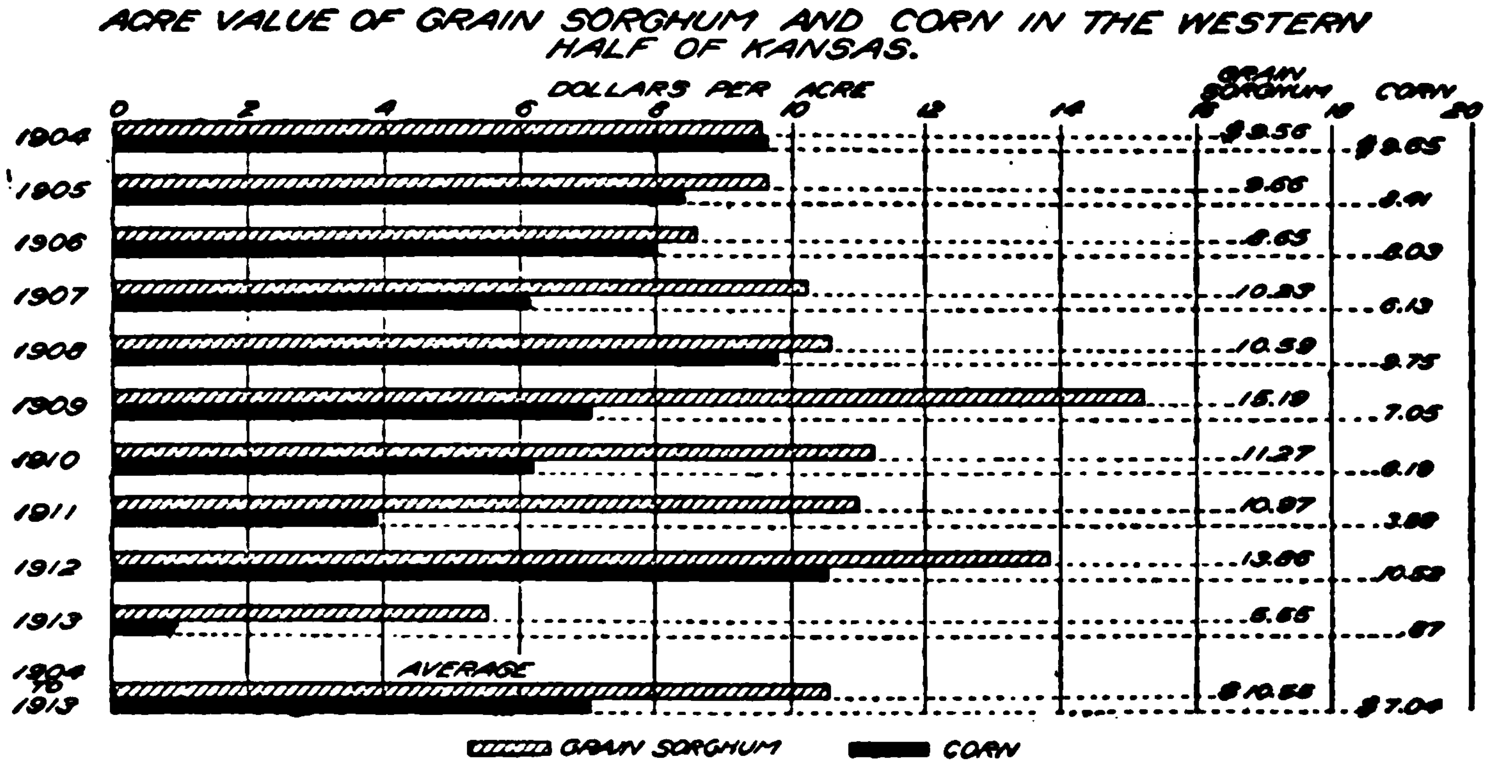

FIG. 10.—Graphic presentation of the annual acre value in dollars per acre of grain sorghum and corn in the 46 counties comprising the western half of Kansas and lying wholly west of the ninety-eighth meridian, for the 10 years 1904–1913, inclusive, and average acre value for the 10-year period.

question. Half of Kansas, containing 46 counties, lies west of the ninety-eighth meridian. Figure 9 shows the area of grain

sorghum and corn in those counties. Nineteen of them already grow more kafir and milo than corn. The average acre value for this area, as shown in figure 10, proves the grain sorghum to be the more profitable crop. We have already seen that for the whole State of Kansas the average acre value of the grain sorghums was $2.14 higher than that of corn during the 10-year period, while in the western half of the State it was $3.51 higher. These figures include the value of the grain-sorghum stover, but not that of corn. However, corn stover is scanty and worth but little in dry areas. After allowing a fair price for it, the grain sorghums are still worth considerably more per acre than corn in the drier portion of

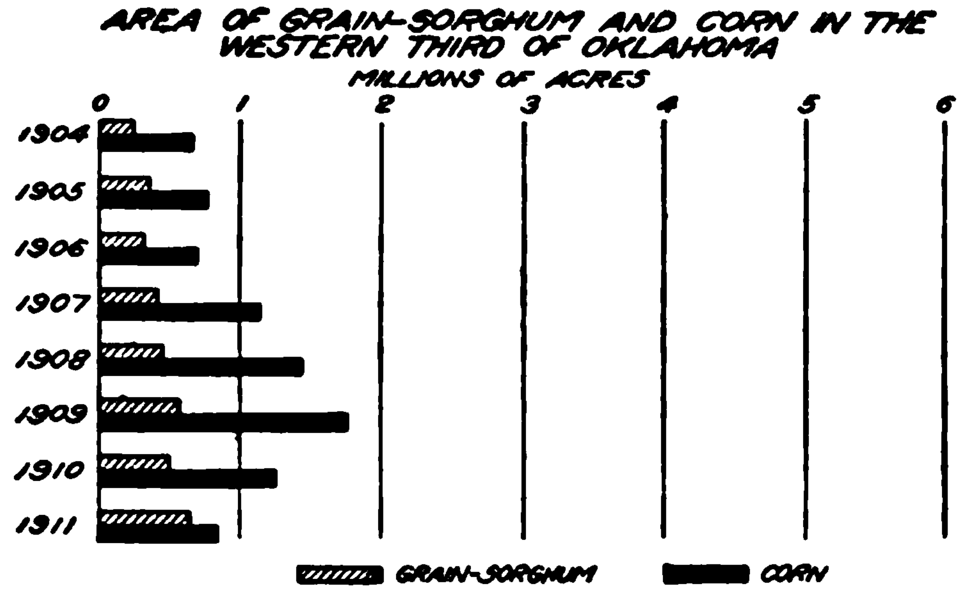

FIG. 11.—Graphic presentation of the annual area in millions of acres of grain sorghum and corn in the 21 counties comprising the western third of Oklahoma and lying wholly west of the ninety-eighth meridian, for the 8 years 1904–1911, inclusive.

the State. This fact, together with their more uniformly certain production, ought to cause further increase in the acreage of kafir and milo in western Kansas.

A comparison of figure 9 with figure 5 shows that fully half of the Kansas grain sorghum is grown in the eastern half of the State. The acre value for the entire State indicates, moreover, that it pays to grow it in eastern Kansas, at least on the uplands.

Similarly, one-third of Oklahoma, containing 21 counties, lies west of the ninety-eighth meridian. Figure 11 shows the acreage in this area of the two crops under discussion. Nine of these counties in 1911 grew more kafir and milo than corn. Figure 12 tells why they did it and why more of them probably were doing it in 1913. In sharp contrast to Kansas, a comparison of figure 11 and figure 7 shows only about one-fifth of the grain-sorghum crop grown in the eastern

two-thirds of the State. When we consider the acre values given in figure 8 for all Oklahoma and in figure 12 for the western third, there is developed a deep suspicion that it would be very profitable to grow kafir and milo farther east in Oklahoma.

Meanwhile what of Texas, the great dry-farming empire of the South? We know that during the years when the kafir industry was developing in Kansas, milo had been carried into Texas by westward-faring emigrants. Gradually it became established on the farms and ranches of the drier western portions of the State (Plate XXXV). No statistical data are to be had, but we know it increased steadily and

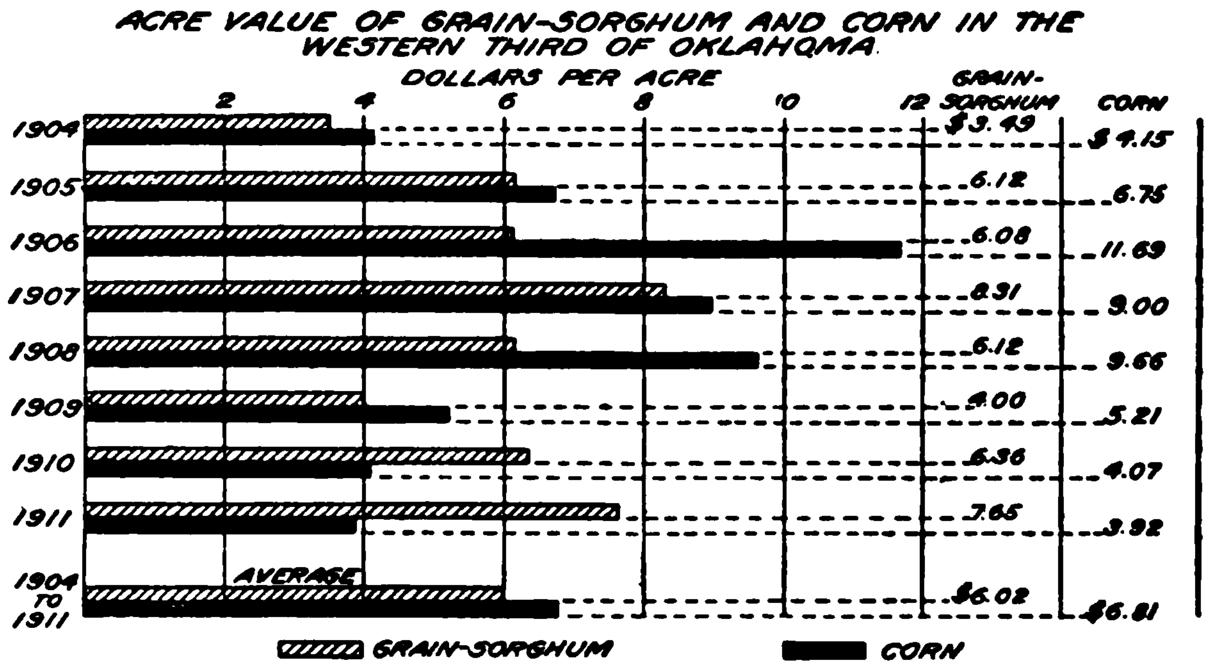

FIG. 12.—Graphic presentation of the annual acre value in dollars per acre of grain sorghum and corn in the 21 counties comprising the western third of Oklahoma and lying wholly west of the ninety-eighth meridian, for the 8 years 1904-1911, inclusive, and average acre value for the 8-year period.

also that the kafirs were soon introduced and became popular. There is every reason to believe that the area devoted to these two crops in Texas has more than equaled the area grown in Kansas, at least until the recent enormous increase.

It is to be regretted that no complete and separate statistics of the acreage and production of grain sorghums are obtained by the Federal Census Bureau. Separate data are now gathered and reported on that portion of the crop from which the grain is thrashed. The portion, however, which is not thrashed, but fed either in the head or bundle, or used for silage, is lumped with fodder and silage corn, sorgos (saccharine sorghums), pearl millet, teosinte, etc., as coarse forage. The acreage represented by each crop is not shown separately. Much of the kafir and milo crop grown in western Oklahoma and western Texas is not thrashed because of the scarcity

of grain separators, this section not producing very large quantities of other cereals. The acreage and importance of grain sorghums would now seem fully to warrant the obtaining and publication of complete statistics of acreage and production wholly apart from those of any other crop.

FEEDING THE FARM STOCK AND THE FARM FAMILY.

From the beginning the kafirs and milos have fed the farm horses that worked to raise the settler's crop and the faithful cow that gave his children drink. They have fed the hogs that fit so handily into the economy of every farm. They have fed the chickens that, more often than is known, have stood between the new settler and privation or failure.

With the testimony of the chemical analysis and feeding experiment, kafir and milo grain began to enter the feeding ration of beef cattle on the Plains. Kafir chops and milo chops became staple articles of bovine diet and kafir-fed cattle were commended at the great stock markets. Meantime the manufacturers of poultry feeds found in kafir the most desirable form of feeding grain. In the thousands of tons of such feeds made annually in the United States about 25 per cent of the material is kafir grain.

These grains have also a place in the human diet. Ground in the coffee mill on the wall of the farm kitchen, the meal has made many a stack of batter cakes on winter mornings. Mixed with varying proportions of wheat flour it is susceptible of every use to which corn meal may be put. As flour it will always be a failure. Like corn meal, it contains no gluten and so will not rise as dough, no matter how much it be coaxed. But as meal it has a flavor of its own and a wide range of usefulness in plain and tasty cooking. Muffins, brown bread, corn cakes, and pancakes par excellence are for him who uses it. In puddings and in pastries it will do all that corn meal may.

At last the grain sorghums had come into their own. No longer were they to be regarded as servants, faithful indeed, but inferior; no longer as poor relations of corn, honest, perhaps, but ragged. Now they were friends and equals, with a standing in the community won strictly on their merits.

IN SOCIETY AT LAST—A KAFIR CARNIVAL.

It was left to Butler County, Kans., to honor herself by arranging the first public reception ever given to kafir and milo in this country. Butler County is not in the drier western part of the State, but in the more humid southeastern section. Part of her soil, however, as that of some adjacent counties, is underlain at slight depths by rock, and the crops grown thereon are likely to suffer at times from lack of soil moisture. Kafir was first grown in Butler County in 1892, and it did not take her farmers long to realize that to such soils kafir was better adapted than corn. So the acreage of kafir increased year by year, until 100,000 acres were planted in 1911.

In the autumn of that year it occurred to the boosters of Butler County to celebrate their popular crop. A three-day kafir carnival was planned to take place on October 18–20 at El Dorado, the county seat. The carnival was an overwhelming success. For three days El Dorado was a kaleidoscope of color, a mecca of merriment. Fully 30,000 people are said to be have been present during the celebration. Kafir was in evidence everywhere. The booths were constructed of it, the buildings were decorated with it, the prizes were given for it. People came from all over Kansas to question and to ponder, and went away to praise.

IN CONCLUSION.

The grain sorghums have made good on the farm; they have been honored in the city. Their names are written in the social register and in the Who's Who of agronomy. They mingle with wheat and corn, the elect, on the boards of trade; they are rated high in the directories of commerce and finance. Hats off, and a hearty cheer as they go forward in the full strength of youth to quietly continue what they have thus far so splendidly done.

THE ORGANIZATION OF RURAL INTERESTS.

By T. N. Carver,
Director, Rural Organization Service.

THE CAUSES OF THE PRESENT DISORGANIZATION.

THE application of steam to the driving of machinery and the hauling of loads is commonly regarded as the cause, on the one hand, of the marvelous industrial expansion of the nineteenth century, and, on the other, of the general economic disorganization which accompanied that expansion. The breaking up of household and domestic industries and the substitution therefor of the factory system, with, in its early stages at least, its hordes of unorganized workers, has usually been referred to as the industrial revolution. This transformation was by no means so sudden as it is sometimes pictured, and it brought much less disaster and much more benefit than pessimistic and reactionary reformers are willing to admit. Nevertheless, there is no doubt that many of the acute problems of the urban economy of the present day grow out of the efforts of the laboring classes to find a new basis of organization to take the place of the old organization whose foundations were swept away by the creation of a world market and the rise of the factory system. This is the philosophy of that which is known as the labor movement.

A change no less profound, though perhaps less spectacular, has taken place in the rural economy of the civilized world, that is to say, of those countries where mechanical inventions have played such a powerful rôle as they have in America and western Europe. Steam and electricity applied to transportation and communication have created a world market for most agricultural products instead of the series of local, restricted markets which existed formerly. Not only were the markets local and restricted, but around such markets there were little communities which were self-sufficing or nearly so. Most of the manufacturing was done either on the farms or in small shops whose goods were exchanged for the products of the farms. The farms were organized at one time in village communities, which were

really groups of small farms, where the crops, their rotation, the time of plowing, planting, and harvesting, were determined by the customs of the village or the authority of the villagers as a whole, where, in fact, everything connected with farming was organized—overorganized, as we should now say. At another time they were under what is known as the manorial system, in which the villagers, known as villeins, were under the supervision and leadership of the lord of the manor, and compelled by his authority to perform certain common work, such as road building, diking, draining, etc., besides working the lands reserved for the support of the manor house. Inasmuch as the lord of the manor was the local ruler and responsible to the King for the safety and order of the community, these services on his land may be regarded as substitutes for taxes in an age when there was very little commerce and practically no money in circulation. Whatever we may think of the village community with its tyranny of inflexible custom, or of the manor with its practical serfdom, still we must admit that both these systems furnished a kind of organization which made it possible to think in terms of the whole community, and to direct the affairs of the community as a unit. In short, the community rather than the individual farm was the economic unit.

The weakness of both these systems was that the cooperation, if that is the right word to use, was compulsory and not voluntary. In the village community the individual was controlled by the tyranny of the mass, and it was impossible for the individual farmer, however wise or skillful he might be, to improve his methods more rapidly than the average intelligence would permit. The manorial system was somewhat more flexible, and, especially under a wise landlord, permitted improvements which were impossible in the village community; nevertheless every villager was subject to the will of the lord of the manor and was permitted to exercise little or no initiative. The mill for the grinding of grain usually belonged to the lord, as did the bull and other expensive articles connected with agricultural enterprise. Thus there were certain important economies effected by this system of compulsory cooperation, but, like all systems of compulsion, it left little room for individual development. It was therefore a distinct step in advance when the manorial system gave way to a more individualistic type of farming.

Long after the decay of the manorial system, many of the advantages of an organized country life remained. On the large English estates, for example, with their numerous tenants and their resident landlords, the latter remained the leaders in agricultural enterprise. The fact that the owners lived on their estates and took a deep interest and pride in their ancestral acres helped to soften the evils of the tenant system. An intelligent landlord who advised his tenants, directed all large enterprises, experimented with different crops and methods, and improved the breeds of live stock performed most of the functions now performed by a county agent or demonstrator, and many more besides. Again, certain communal rights remained to the villagers and the small farmers, such as the right of gathering fire wood, cutting turf, and pasturing cattle on the common. These common interests compelled a certain amount of united action and gave a certain organic character to rural life. Every member of a rural community realized that he had a definite status in the community, that the community could command his services in a considerable number of details, and that he in turn possessed certain rights to the common utilities of the place.

In the New World, particularly in New England, the methods of founding settlements generally promoted an organized rural life. Sometimes the minister of a church gathered a congregation about him, led them out into the wilderness, and planted them on the soil with the church as the center of the community life. Even where this particular type of "swarming" was not followed, the grant of land was commonly made, not directly to an individual, but to a town or township, and the individual in turn got his grant from the township. The management of the common lands was a perennial problem calling for the effective organization of all the citizens of the township. The townships became, therefore, the units of local government. Being a small and effective unit, and having certain definite problems of an economic nature forced upon it, the township easily undertook other tasks of a voluntary nature, such as drainage operations, the branding of live stock, the appointment of herdsmen to guard all the cattle of the town, the public ownership of bulls, the fencing of the common lands, the construction of roads, etc.

Not only in New England, but everywhere on the frontier, there were common overwhelming needs, such as common defense, the clearing of the forest, the erection of buildings, and other tasks demanding the united strength of the whole community, which forced the people into a kind of cooperation. After the passing of the frontier days there remained such common local interests as the local school, the care of the roads, and the maintenance of the cemetery, to bring the people together around a common interest and give the neighborhood at least the germ of an organization.

Under the public-land policy of the Federal Government, however, particularly under the preemption and homestead laws, an extremely individualistic method of settlement was promoted. This doubtless served important public purposes, but it tended to promote disorganization rather than organization. Lately the tendency has been to take the roads and schools out of the hands of local units and put them directly under county and State administration. Doubtless a higher administrative efficiency is secured by this change, but it tends to remove the last vestiges of the old basis of rural organization. It is doubtless to be desired that this centralizing process should go on until the entire school system of a State is administered as a unit and every country child is provided with as good a school as any city child. At the same time it will be necessary to find a new basis of organization to take the place of the old bases which have been swept away.

EFFORTS AT REORGANIZATION.

Efforts have not been wanting in this direction. Beginning with the granger movement of the late sixties and the early seventies of the last century, the country has witnessed series of movements, some ephemeral and some lasting, [illegible] time we have the National Grange, which [illegible] agricultural organization in the northeastern [illegible] Farmers' Educational and Co- [illegible] s very strong in the South; the [illegible] trong in Michigan and parts [illegible] nerican Society of Equity, [illegible] hwest, besides many smaller [illegible] ovements toward an effect- [illegible] have been very uneven in [illegible] ous failures as well as [illegible] has [illegible]

strated that it has found the key to universal success in this direction. There is need, in the interest both of these existing organizations and of the multitudes of farmers not yet affiliated with any organization, that a permanent body of some kind should begin a comprehensive study of the whole problem of organizing rural life for economic, sanitary, educational, and social purposes. Even if such a body should do no more than keep a permanent record of the successes and failures among farmers' organizations, it would eventually become of incalculable value as a guide for future organizers. But if, in addition to such a record, this body could formulate principles of organization, and give permanency and consistency to the efforts of active field organizers, its work would be of much greater value.

Aside from these fraternal and social organizations among farmers, there have been vast numbers of organizations to promote special agricultural interests. The States of the upper Mississippi Valley are honeycombed with farmers' mutual insurance companies. These have had a longer history of uniform success than any other type of business organization among our farmers. The accompanying table shows the number of such companies in States which publish official lists. There are farmers' mutual insurance companies in other States which report that they publish no official lists, and these States are necessarily omitted from the table. (See fig. 16 and 16 A.)

Farmers' mutual insurance companies.

Arkansas	7	New Hampshire	19
California	18	New Jersey	23
Colorado	5	New York	163
Connecticut	14	North Dakota	33
Delaware	8	Ohio	102
Georgia	7	Oklahoma	1
Idaho	5	Oregon	3
Illinois	230	Pennsylvania	237
Indiana	76	Rhode Island	1
Iowa	176	South Carolina	19
Kansas	29	South Dakota	33
Kentucky	25	Tennessee	17
Maine	54	Texas	25
Maryland	17	Washington	6
Michigan	77	West Virginia	11
Minnesota	150	Wisconsin	203
Montana	7	Total	1,867
Nebraska	66		

The organization of farmers' mutual telephone companies has had a phenomenal development in the last two decades. As an agency for bringing farms into closer contact with one

FIG. 13.—Cooperative creameries in the United States. Small dot=1 creamery; large dot=10 creameries.

Arkansas	1	Illinois	62	Michigan	106
Arizona	1	Indiana	67	Minnesota	632
California	36	Iowa	306	Mississippi	1
Colorado	14	Kansas	7	Missouri	16
Connecticut	15	Kentucky	14	Montana	9
Delaware	2	Maine	7	Nebraska	14
Georgia	2	Maryland	3	Nevada	3
Idaho	3	Massachusetts	8	New Hampshire	6

another and creating thus a basis for further organization, the importance of a rural telephone system can scarcely be overstated, especially when it is established and managed by the farmers themselves.

Cooperative creameries, cheese factories, and elevators, according to our latest reports, are distributed through the middle Northwest as indicated in figures 13, 13 A, 14, 14 A, 15,

FIG. 13A.—Cooperative creameries in the United States. Small dot=1 creamery; large dot=10 creameries.

New York	120	South Carolina	1	Washington	17
North Carolina	2	South Dakota	46	West Virginia	2
North Dakota	43	Tennessee	3	Wisconsin	355
Ohio	32	Texas	19	Wyoming	1
Oklahoma	10	Utah	6		
Oregon	8	Vermont	59	Total	2,165
Pennsylvania	99	Virginia	6		

and 15 A. The question is often raised as to whether these are all strictly cooperative. Undoubtedly many of them are, in form at least, merely joint stock companies, and it may be claimed that such companies are not cooperative in the

strict technical sense. Such a claim, however, is based upon the letter rather than the spirit of the enterprise. Any organization of this kind may be said to be cooperative

FIG. 14.—Cooperative cheese factories in the United States. Small dot=1 cheese factory; large dot=10 cheese factories.

California	3	Michigan	4	Missouri	2
Illinois	2	Minnesota	15	New York	34
Indiana	1				

in spirit when it is managed exclusively with a view to giving the farmer a better price for his butterfat or his grain, and not at all for the purpose of securing dividends on the

stock. If the stock is owned by farmers and if each share of stock is in practice limited to a normal rate of interest and all surplus earnings go to the farmers in the form of

FIG. 14A.—Cooperative cheese factories in the United States. Small dot=1 cheese factory; large dot=10 cheese factories.

Ohio	2	South Dakota	1	Washington	3
Oregon	2	Utah	6	Wisconsin	247
Pennsylvania	13	Vermont	1	Total	336

better prices, the enterprise is cooperative in spirit, even though its form be that of the ordinary profit-making corporation.

However, it must in frankness be admitted that there is always danger, under the joint stock form of organization, that the cooperative spirit will be destroyed and the organization shifted to the profit-making purpose. In a creamery,

FIG. 15.—Farmers' cooperative elevators in the United States. Small dot=1 elevator; large dot=10 elevators.

Arkansas	2	Indiana	28	Michigan	22
Colorado	4	Iowa	332	Minnesota	286
Idaho	4	Kansas	149	Missouri	8
Illinois	280	Kentucky	1	Montana	25

for example, if one man owns a large number of shares and very few cows, or none at all, he will naturally be more interested in dividends than in the price of butterfat. If a majority of the shares are owned by such men, the company

is almost certain to be managed in the interest of dividends rather than in the interest of the price of butterfat. It is therefore highly desirable that the form of organization be such as to prevent this result and insure that the manage-

FIG. 15A.—Farmers' cooperative elevators in the United States. Small dot=1 elevator; large dot=10 elevators.

Nebraska	224	Oregon	3	Wisconsin	51
North Dakota	320	South Dakota	220		
Ohio	23	Texas	4	Total	2,020
Oklahoma	36	Washington	18		

ment shall always be in the interest of the producers. Nevertheless, so long as the management is in the interest of the producer, it is reasonable to list such an organization as cooperative.

A multitude of cow-testing associations, breeders' associations of various kinds, purchasing associations for securing

FIG. 16.—Farmers' mutual insurance companies in the United States. Small dot=1 company; large dot=10 companies.

Arkansas	7	Idaho	5	Maine	54
California	18	Illinois	230	Maryland	17
Colorado	5	Indiana	76	Michigan	77
Connecticut	14	Iowa	176	Minnesota	150
Delaware	6	Kansas	29	Montana	7
Georgia	7	Kentucky	25	Nebraska	66

better prices on fertilizers, seed, and feed stuffs, and cooperative stores dealing in general merchandise dot the entire country.

The large farmers' organizations, such as the Grange, the Farmers' Union, the American Society of Equity, and the

FIG. 16A.—Farmers' mutual insurance companies in the United States. Small dot=1 company; large dot=10 companies.

New Hampshire	19	Oregon	3	Texas	25
New Jersey	23	Pennsylvania	237	Washington	6
New York	163	Rhode Island	1	West Virginia	11
North Dakota	33	South Carolina	19	Wisconsin	203
Ohio	102	South Dakota	33		
Oklahoma	1	Tennessee	17	Total	1,967

Gleaners, are also, in many localities, transacting business for the individual farmer. Cooperative warehouses, under the Farmers' Union, are doing business aggregating tens of millions of dollars annually.

NEED OF A PERMANENT BODY TO GIVE CONSISTENCY TO THE MOVEMENT.

It is not too much to suggest again that it is of the utmost importance that all these scattered movements should be brought together and the work systematized in order that the number of failures may be diminished and the number of successes be increased. It is doubtful if any single agency can do this satisfactorily, but the Rural Organization Service of the Department of Agriculture may easily become one of the most effective agencies for bringing about this result.

NEW BASES OF RURAL ORGANIZATION.

MARKETS.

One of the first tasks of such an agency must be to formulate the general principles which must control all successful organizations, and also to find a satisfactory basis upon which to build a comprehensive organization of rural life to take the place of the old basis that has been swept away by general reorganization of the economic world. During this age of mechanical inventions it will never again be possible to build a rural community on the self-sufficing basis on which the farmers produce for their own local market and get the most of their supplies from the local handicrafts. Each farming community is a part of a world market and the bulk of its produce must be shipped out and the bulk of its articles of consumption shipped in. This must be taken as a fundamental fact in all schemes for a new rural organization. Therefore it would seem that the reason for the existence of a rural organization must be found, in part at least, in the necessity for the successful marketing of products on the one hand and the successful purchasing of supplies on the other.

CAPITAL.

Another large and fundamental fact in the modern economic world, also growing out of the mechanical inventions which characterize it, is the demand for increased capital in all successful agricultural enterprises. In an age when farming was done with a few simple tools, the most of which could be made by the farmer himself during his spare time, the demand for capital could be ignored. But at the present time one of the paramount needs of agriculture is an adequate supply of expensive tools or capital. In order that the

average farmer may properly equip himself, it is necessary that he be put in possession of purchasing power. This can only be secured through his own savings or through the savings of others from whom he can borrow. This means the development of credit facilities.

SANITATION.

In an age when sickness was regarded as a visitation of Providence from which there was no reasonable means of escape, the problem of sanitation was unknown. Such a thing as an organization for rural sanitation would have been unthinkable, for the reason that, knowing little or nothing about the sources of disease, such an organization would not have known what to do with itself. But now that medical science has put us into possession of certain large and definite facts regarding the prevention of some of the more common diseases, the problem of protecting the health of rural communities is becoming practical. We are in a position to combat certain diseases if we are ready to go about it in the right way. Our great lack now is not so much the lack of knowledge as the lack of organization for applying our knowledge. It is quite as possible for us to exterminate certain disease germs as it was for our ancestors to exterminate the wolves and bears which preyed upon them and their flocks. When we awaken to the situation we shall find here an overwhelming need as great as that which existed on the frontier to force us into an organization for the protection of country life.

Thus the organization of the community so as to function more effectively in the world market may furnish a substitute for the local self-sufficing market of an earlier period; the organization of the community may supply the need for capital, which was an unknown need before the age of machinery, and organization for the purpose of fighting the invisible enemies known as disease germs may take the place of the older organizations to fight the visible enemies of the frontier.

METHOD OF PROCEDURE.

It will occur at once to any thoughtful student that the first task in the general reorganization of country life must be to learn the facts as they exist at the present time. This necessitates a better survey of the entire field of American

country life for the purpose of finding out what types of organization are now succeeding, and why; and what types have failed and are failing, and why; what special needs exist for which there are no effective organizations, and where these needs are greatest. A preliminary study of credit conditions has already shown that the farmers of different sections of the country are very unevenly provided with credit facilities, some sections having excellent, others very poor ones. The reasons for this variation need to be carefully studied before any satisfactory solution can be suggested. Until such a survey can be completed, not only with respect to rural credits, but also with respect to farmers' organizations of all kinds, very little advice can be given except in the most general terms.

PRINCIPLES TO BE OBSERVED

The following suggestions are made as a general guide for organizers in different fields of endeavor:

IN COOPERATION.

There is no magic about cooperation. If, as the result of cooperation, farmers are led to improve their business methods, it will succeed; otherwise it will fail. These improvements in their business methods should include the following points:

(1) Accounting and bookkeeping. No cooperative organization of any kind can hope to succeed, nor would it deserve to succeed, unless it kept its books accurately and completely. Correct accounting is the key to all successful administration, public or private, cooperative or individualistic.

(2) Auditing. No one with any feeling of responsibility will undertake to advise a cooperative society or stand in any way responsible for its affairs, unless that society will submit its books annually for a thorough auditing by a competent and reliable auditing company.

(3) Motive. It must be prompted by a constructive desire for well-understood economies and not by rancor, or jealousy, or covetousness, or any other destructive sentiment. One of the most frequent causes of failure in cooperative enterprises is the fact that the whole enterprise was started out of something very closely resembling spite, or the fear that somebody might be making something in the way of

profit. If a storekeeper or anyone else is making a profit by reason of the efficiency with which he runs his business or serves his customers, he is entitled to it, and any cooperative society which is started merely for the purpose of keeping him from making that profit is doomed to fail. If, however, there are clearly perceived wastes occurring, due to inefficiency, bad management, or the taking of excessive profits, and a cooperative society is formed for the constructive purpose of eliminating those wastes through better management, the society will have the first requisite of success, namely, the fact that it deserves to succeed.

IN MARKETING.

The general subject of marketing is provided for under the capable management of the Office of Markets of the Department of Agricuiture. Inasmuch, however, as the subject of organization is very closely associated with the subject of markets, and the Rural Organization Service and the Office of Markets are working in the closest cooperation, it is not out of place to suggest here a few of the main conditions of successful marketing. They are:

(1) The improvement of the product. This ought to be one of the first results of cooperation. A group of farmers, all interested in growing the same product, by meeting frequently and discussing the problems connected with the growing of that product, will normally educate one another and thus improve their methods of production.

(2) The standardization of the product through organized production. Standardization follows naturally and easily if the cooperators are wise enough to see its importance. Not only must the product be a good product, but it must be graded according to the tastes or desires of the consumers or ultimate purchasers. If the producers insist on throwing an unstandardized, nondescript product upon the market, the consumers, each one of whom wants a small and simple parcel, and wants that to be of a certain kind and quality, will never buy of the producers. Some one, then, must intervene to do the grading and standardizing. But if the producers will grade their products and pack them the way the consumers want them, they will be able either to sell directly to the consumer or so to reduce the toll charged by the middleman as to enlarge their own profits.

(3) Branding. An excellent product, graded and standardized, must then be so branded or trade-marked as to enable the consumer to identify it or to recognize it when he sees it. That is really all there is to the stamp on a coin. It adds nothing to the intrinsic value of the metal, but it makes it circulate. Without such a stamp, each individual would have to weigh and test a piece of metal which was offered him, and the circulation or salability of the metal would be greatly restricted; but a stamp upon it, which the average receiver recognizes at once and in which he has confidence, makes him instantly willing to accept it. This may be an extreme case, but it does not differ in principle from the stamping of any other salable piece of material. A private stamp is quite as good as a Government stamp *if* people have as much confidence in it as they have in a Government stamp and if it is as reliable and as uniform. Private coins have circulated many times in the past. However, without taking such an extreme case as the coinage of metal except by way of illustration, it will not take much argument to convince the average person that if a box of apples bearing a certain stamp or trade-mark gets to be known as reliable and good all the way through, the producer or the producing association whose stamp has thus gained confidence will be able to sell where unstamped products equally good will fail altogether.

(4) Education of the consumer. The consumer must be educated as to the meaning of a stamp or trade-mark on goods which are excellent in themselves and uniform in quality.

Let these four things be done and the problem of marketing will become fairly simple. But it must be remembered that these four things can be done only by organization.

IN PURCHASING SUPPLIES.

Much complaint is heard from farmers and farmers' associations regarding the unwillingness of manufacturers to sell directly to them and eliminate agents' profits. There is doubtless some ground for this complaint, in many cases at least. Where this unwillingness is arbitrary and without reason, the farmers, through their organizations, must try by every legitimate means, both legislative and nonlegislative, to overcome it. But he is no friend to the farmer who

does not tell him the disagreeable truth that he is himself sometimes to blame for this situation. Not being trained in commercial practices, the farmer, or the farmers' organization, is sometimes unprepared to handle the business of buying in a businesslike way. The manufacturer will then prefer to sell through an agent or a regular dealer who is accustomed to handling business promptly and who does not need to be shown how. Again, farmers' organizations are not always prompt in paying bills. Where this is the case the manufacturer can not be blamed for preferring to sell through a regular dealer in whom he has confidence. Another and more serious complaint on the part of the manufacturer is that farmers' organizations frequently lack a keen sense of business obligation. They will order a carload of goods, for example, at a given price. Before the goods can be delivered, someone else offers to supply the farmer at a slightly lower price. In spite of the fact that their previous order is a virtual contract, they take the lower bid and refuse to take the goods delivered on the previous order when they arrive. Naturally this does not please the manufacturer who filled the order in good faith. He can not be blamed for being unwilling to fill similar orders thereafter. Possibly he ought to discriminate between such irresponsible farmers' organizations as this and others which have a true sense of business responsibility; but all men are prone to generalize. The way to cure this situation is for farmers who have business training and a sense of business responsibility to lend their aid in eliminating irresponsible organizations from the field. Otherwise they will suffer from the company they keep.

IN SECURING CREDIT.

There is no mystery about credit. It is simply a means by which the possessor of purchasing power, which he does not care to use at once, is enabled to transfer that purchasing power to some one who does not possess it but who needs it at once in his business. Again, the possession of credit on the part of the farmer does not insure his success. When wisely used, credit is a powerful agency for good: so is dynamite. When unwisely used, or handled by one who does not understand it, it is dangerous: so is dynamite.

Speaking by and large of facts as they actually are at the present moment, it is probable that as many farmers are suffering because they have too much credit as because their credit opportunities are too limited. To be able to borrow a thousand dollars even at the lowest possible rate of interest, say 2 per cent, is a loss to a man who invests it in a way to only bring back $1,001. The only possible advantage of having credit is to have an investment which is reasonably certain to return not only the principal but the interest and a little more besides.

Much has been said about the cooperative credit organizations of other countries. One fact which has never been sufficiently emphasized, and which can not be too much emphasized, is that these cooperative credit societies refuse credit quite as often as they give it, and they refuse credit not simply on the ground that the would-be borrower has no security to give, but equally on the ground that they do not think it would pay him to borrow. That is, he has no investment which, in the opinion of the directors, will be profitable to him. If his investment is unprofitable, the chances are that he will be unable to pay back a loan, and thus it would be unsafe. And, what is more important, even if he were able to pay it back, he would be poorer instead of richer by reason of the loan. The fact that the directors of one of these cooperative banks have to discuss the purpose for which the borrower wishes to borrow, and to decide whether or not it will probably turn out to be a good investment for the borrower, not only protects the borrower against himself but educates all the members of the society. That is to say, it compels them to discuss very carefully the probable results of all the classes of small investments, and this discussion itself is one of the most valuable kinds of business education.

THE PRODUCTION OF BEEF IN THE SOUTH.

By W. F. Ward,

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INTRODUCTION.

IN the United States three decades ago the beef industry was growing very rapidly. The western country was used as free range and enormous herds of cattle were springing up all over the West. Then, too, the States which now comprise the corn belt were grazing many cattle. The business expanded and flourished until the early nineties, when prices began to drop and the industry to decrease until many of the large ranches of the West were broken up. The period from 1892 to 1900 was a hard one for the cattlemen, and cattle other than milch cows decreased 10,040,000 head.

When the prices of cattle fell so low during the period of 1893–1896 many of the farmers through the Middle West began to reduce the size of their herds. Wheat and corn became the staple crops, and they were given far more attention than were cattle. The price of land throughout this section began to increase very rapidly and as a consequence the herds of cattle on much of it diminished in size. With the advance of land values immigrants kept pushing farther west, and the settlers, homesteaders, and sheepmen began crowding the cattlemen farther from the good grazing lands to the less desirable sections.

The production of beef was discouraged and retarded not only by the low prices and the decrease of breeding stock, but also by the cutting up of the ranges, the increased value of farm lands, and the prevailing prices paid for grain. The price of cattle did not keep pace with the price of other commodities.

RELATION OF POPULATION TO MEAT SUPPLY.

With the population increasing steadily and the amount of beef consumed per capita keeping about in proportion, there could but follow a period of shortage of beef cattle. This was predicted by many farsighted men who made a study of conditions affecting the supply of beef. However,

statements made to that effect were not taken seriously by the public until the last three or four years.

The census of 1900 shows that there were on farms and ranches 50,583,777 cattle other than cows kept for milk, while the census of 1910 shows this number to have decreased to 41,198,434 head. This was a decrease of 9,385,343 head, or 18.5 per cent, of all cattle other than milch cows. The number of cows increased 4 per cent, but the number of steers and bulls decreased 21.1 per cent, and the calves decreased 49 per cent, or 7½ million head, during this period.

The census of 1900 was taken June 1, while that of 1910 was taken April 15, or six weeks earlier. A portion of the large decrease in calves can be attributed to this difference in the time the two censuses were taken, but with the other animals there would have been a greater decrease had the 1910 census been taken June 1, due to the cattle that would have been slaughtered during this period of six weeks.

During the decade 1900–1910 the population of the United States increased 21 per cent. It is safe to say that the amount of meat consumed per capita remained almost the same. It is then seen that with an increase of 21 per cent in the demand for beef in the United States and with a decrease of 18.5 per cent of the cattle available for slaughter purposes, a decline in the exports of beef was inevitable. This decrease actually took place and the amount of beef exported from the United States, both alive and as dressed, pickled, and canned, amounted to but 2.45 pounds per capita in 1910, while the amount exported in 1900 was 9.37 pounds. In other words, there was a decrease of practically 7 pounds of beef per capita exported during the decade 1900–1910 because of the increased home demand.

If the population increases in the decade 1910–1920 in the same ratio as in the previous decade, and beef cattle do not increase in numbers during the same period, there must be a greater shortage of beef than at the present time. In fact, since 1910 the export trade has decreased until during 1912 there was but 1½ pounds of beef per capita exported from the United States. The amount of beef exported as live animals and fresh, canned, and pickled beef during the year 1912 amounted to the equivalent of 197,475 head of cattle, while the number imported was 318,372, the majority of

which came from Mexico. In other words, this country has, at least temporarily, ceased producing as much beef as is demanded for home consumption, for the imports for 1912 were over one and one-half times greater than the exports.

The receipts of sheep and hogs at the leading markets of the country for the first half of the year 1913 have been below the average, and indicate that there is no large surplus available for immediate slaughter. The decrease in the numbers of these animals will, in a measure, prevent the public from turning largely to them as substitutes for beef.

WORLD SUPPLY OF BEEF.

The question of producing enough beef to supply the demand is now recognized as one of world-wide importance. There is at present a shortage over the entire civilized world. Argentina, which once loomed large upon the horizon as a rival of the United States in the supply of beef, proved to have but 28,766,168 cattle according to the 1911 census, or fewer cattle than were in the country in 1908, when 29,116,625 were enumerated.

The United Kingdom, which formerly depended very largely upon the United States to furnish its imported beef, has been forced to look to Australia, Argentina, and Canada to supply this commodity. At the present time Great Britain is consuming practically all of the surplus output from these countries and any additional surplus produced will be readily absorbed by other European countries. The probability of the United States importing much beef from these countries in the next few years is, therefore, doubtful. Imported beef must come from Mexico and Canada, and the amount which may be contributed annually from these countries will probably not greatly exceed the present imports for several years. The number of cattle imported from Canada will be small, for there are not many more produced there than are necessary for home consumption, and most of these are sent to England.

RESULT OF DIMINISHED SUPPLY AND INCREASED DEMAND.

The decreased production of beef cattle and the increased home demand could result in but one thing—higher prices. These have followed, as shown in the following table, which

presents the average price of all cattle sold at the leading markets of the country on March 15 for the last four years:

Average price per 100 pounds of beef cattle and veal calves on leading markets, March 15, 1913–1910.

Year.	Beef cattle.	Veal calves.	Year.	Beef cattle.	Veal calves.
1913	$5.88	$7.49	1911	$4.65	$6.48
1912	4.75	6.11	1910	4.87	6.59

Veal is becoming more popular and the consumption of this commodity is increasing very rapidly. This has a tendency to lessen the supply of meat, for although many of the calves that are used for veal would never develop into choice beef animals, there is still a large percentage of them which would grow into good beeves, thereby increasing the available supply.

METHODS OF INCREASING THE BEEF SUPPLY.

There has been much discussion about methods of increasing the supply of beef and many remedial measures proposed, among which the one most frequently discussed is the passing of laws in all the States making it a crime to slaughter any female cattle under 3 years of age. This is not feasible at the present time, as it would work a hardship on many a small farmer who could not keep all of his females until 3 years of age, and it would be a greater handicap to the dairyman who breeds his cows primarily that the milk supply may be kept up and not for the value of the calf produced. He can feed a calf for a few weeks and sell t for $8 to $12 for veal, which if kept would not make a [illegible]esirable beef animal, nor one suitable for breeding pur[illegible] [illegible] has been advocated would proba[illegible] [illegible] the farmer to keep his female [illegible] would be to exempt all [illegible] The plan [illegible] to depriv[illegible] [illegible] of cattle [illegible]

land is worth from $75 to $200 per acre and corn has advanced from 25 to 60 cents or more per bushel; not from the ranges of the West and Southwest, for the supply of cattle from these sections is decreasing yearly and the large ranches are being cut up for the homesteaders and the small farmers, who are not giving their attention to beef production.

POSSIBILITIES OF THE SOUTH.

There is one section that can produce more cattle, and produce them more cheaply, than any other section of the whole country, for the lands are still cheap, the grazing is good, the pasture season is long, feeds can be produced at a minimum cost, and inexpensive shelter only is required. That section of the country is the South.

While slavery existed in the South, cattle, hogs, and sheep were to be found upon every plantation, and on many of them were very good beef animals, some herds of which contained a large infusion of Shorthorn blood. At this time the South produced all of the beef, pork, and mutton that was needed to supply her demands. At the close of the Civil War few cattle were left and these were bred among themselves without the addition of any new blood, except occasionally a cross with the Jersey, the result of which was a class of native cattle which were small, slow in growth, and of very poor quality for beef. At this time farmers were discouraged from bringing in pure-bred animals from the North, as a very large proportion of them, sometimes as much as 85 per cent, would die the first year from a disease known as "murrain," or "bloody murrain," the direct cause of which was at the time unknown. Nor could planters afford then to introduce pure-bred beef animals as they had formerly done while in a prosperous condition.

Corn and other grains had formed the major portion of the crops during the early slavery times, but with the improvement of the cotton gin an increased amount of cotton was raised each year until 1861. After the slaves had been freed cotton was high in price and it was hard to get labor, as there was little money with which help could be hired. This condition made it imperative that the southern farmer produce some crop which could be readily sold to buy clothing and other necessities. It was then that men who had money or could borrow money in the North began advancing, or selling

on credit, rations, feedstuffs, and clothing to farmers who would produce cotton and give the advancing merchant a mortgage on his crop. As the planter could thus buy the necessities for his negroes on credit before the crop was made and immediately after gathering it he could convert it into cash with which to pay his labor, this method became popular and established the one-crop system which has proven such a burden to the South in late years. This method of farming caused some lands to be planted in cotton for as long as 30 years in succession, which depleted the soil to such an extent that live stock are necessary to build up the soils to their former state of fertility.

ABANDONMENT OF THE ONE-CROP SYSTEM.

The spread of the Mexican boll weevil over the western and the central portion of the South has caused many farmers to abandon the one-crop system and begin diversified farming and the rotation of their crops. Diversified farming in the South means the production of more grains, hays, and other roughages, which leads up to the production of live stock to consume them.

It is with the idea of getting away from the old one-crop system, lessening the damage done by the boll weevil, increasing the fertility of the soil, doing away with a large portion of the credit system with the resulting high rates of interest attached to it, and producing their quota of meats in order to avert a greater shortage than at present exists, that the raising of live stock and consequently diversification of farming is urged upon the southern people.

The cheapness of the lands throughout the South makes it possible to own quite extensive farms for the production of both forage crops and pastures with a comparatively small investment of capital. Cheap lands, combined with cheap cows for foundation stock, enable one to start in the cattle business in that section with an outlay of far less capital than in most other portions of the country.

Water and shade in abundance are found throughout the South, and the seasons are usually so mild that expensive barns are not needed for cattle as in the North. The only shelters needed for beef cattle in the South are open sheds facing the south, under which young cattle may take shelter

from cold rains or wind. The mature beef cattle need no other protection than that afforded by trees, hedges, undergrowth of "switch" cane or brush, and other natural shelters.

PASTURE LAND AND GRASSES.

Many of the plantations of the South are so large that there is much of them which can not be utilized for raising crops. These lands should be used for producing cattle. Other lands which are at present lying idle and upon which taxes are being paid could be easily converted into pastures, and by the planting of some of the grasses and clovers they would produce a pasture of such quality as to give high returns on the valuation of the land when grazed by cattle. (See Pl. XXXVI.)

Publications from the Census Bureau indicate that in the South in 1910, 63.1 per cent of the total land area was in farms, of which 42.5 per cent was improved farm lands. Of the total land area there was in 1910 but 26.8 per cent which was classed as improved farm land to be used for cultivation, etc. This means that 57.5 per cent of the farm lands, or 73.2 per cent of the total land area, of the South is made up of grazing land, woods, or waste lands, and a very large portion of this amount would produce excellent pastures for cattle. In 1910, however, the whole South produced but 31.6 per cent of the cattle of the United States, while the North produced 53.5 per cent. This ratio of production should not hold true, for 70.1 per cent of the farm land of the North was improved and was chiefly used for cultivation.

The types of soils and the nature of the land vary widely in each State, but in each are found soils which produce abundant grazing. The rolling lands of Virginia, the Carolinas, and Tennessee, the hill lands of Georgia, the black lands of Alabama and Mississippi, and the alluvial lands of Mississippi, Louisiana, and Arkansas, all produce luxuriant grass for about seven months of the year. The stiffer soils usually afford better grazing and produce fatter cattle than the light or sandy soils. In some of these States bluegrass does well; but where it does not, Bermuda will grow.

On the lime soils, melilotus, white clover, Johnson grass, bur clover, lespedeza, and other pasture plants will grow and furnish ideal pasture. If the clovers are not present a few pounds of the seed should be scattered over the land in Feb-

ruary after the land has been scarified with a disk harrow. After these clovers once get a start, they will reseed themselves each year, unless grazed exceedingly close. The growing of these plants not only increases the grazing capacity of the pasture, but rapidly improves the fertility of the soil.

Bermuda grass is the most important grass of the South and can be easily started by dropping cuttings of the sod in furrows 6 feet apart and covering with a light furrow, or with the foot and tramping the dirt down firm. This should be done early in the spring, and the grass will spread very rapidly during the summer months. Bermuda, lespedeza, and bur clover will grow well together on any kind of soil and make an ideal combination for pasture, as the bur clover will furnish grazing in February, March, and April, the Bermuda from April 15 until frost, and the lespedeza from July until October. This combination of forage plants contains two which add nitrogen to the soil. Most important of all the clovers for southern grazing is lespedeza, which spreads very rapidly after it gets started and can not be killed out by grazing. By the use of bur clover, melilotus, and white clover the pasture season can be extended so that at all times of the year, except when the cattle would be in the cotton or corn fields, they would find some kind of green pasture.

In eastern and southeastern Texas the grasses are the same as those which grow in the other Southern States. In western Texas is found the mesquite grass, and in some places buffalo grass and grama grass. These give good grazing during years of normal rainfall.

FORAGE CROPS AND FEEDS.

The amount of roughage grown in the South is small compared with that produced by some of the States of the Middle West. Still there is no section of the country that will grow such a variety of leguminous hays and other forage crops as the South. Cowpeas, soy beans, and crimson clover will grow luxuriantly in any of the Southern States, while alfalfa, melilotus, and velvet beans grow in various sections.

The corn-growing tests which have been conducted in every Southern State during the last few years show that corn can be produced in large amounts per acre and as cheap as in other States. The wide variation of time during which it

may be planted, combined with its luxuriant growth in southern latitudes, make it exceedingly valuable as a silage crop. A yield of 10 to 14 tons of silage per acre is not at all uncommon on the good lands, while the average yield is about 7.

There are several other crops which grow in the South that make excellent silage, chief among which are sorghum, soy beans, and cowpeas. Sorghum can be planted later than corn and often makes a heavier yield per acre. When mixed with corn or soy beans it makes excellent silage. The Tennessee experiment station has found that silage made of soy beans and corn is far more valuable for feeding cattle than silage made of corn alone.[1] The difference in feeding value was great enough to make it more profitable to put up a mixed silage than to put corn alone into the silo. The same station found that sorghum silage could be produced much cheaper than corn silage, and the yields were practically the same per acre.[2]

Milo maize and kafir corn each make a good silage and are very valuable in some portions of the Southwest, where they will make a good yield of forage during a season which is so dry that Indian corn would make but little growth.

The principal hay crops of the South are alfalfa, Johnson grass, prairie grass, cowpea, soy bean, crimson clover, and in some sections red clover, melilotus, lespedeza, crab grass, and Bermuda. Excellent yields of cowpea or sorghum hay can be secured after one of the small-grain crops or crimson clover has been harvested. Where lespedeza grows rank enough to cut for hay it is especially valuable, as it can await cutting from September 1 to October 15 without appreciably deteriorating in value, and it cures very quickly. In addition to the various kinds of hay, there are several varieties of coarse fodders and much rough straw produced which have their uses in live-stock feeding. In the extreme South velvet beans and Japanese cane are planted largely for forage purposes.

In addition to the various feeds which can be grown upon the farms for the cattle, there is one which is produced as a by-product of the cotton industry which is more valuable than any other known cattle feed—cottonseed meal. With the enormous output of this commodity at home the list of feeds necessary to produce good beef cattle is complete.

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[1] Results unpublished. [2] Tennessee Bulletin 3.

TICK ERADICATION.

The Federal Government realized the importance of the Southern States as a field for producing beef cattle, and as a result began investigations in breeding and feeding cattle in the South in 1904, and in 1906 began a systematic fight on the cattle tick; for the disease known as "murrain," or "bloody murrain," which killed so many cattle that were brought into the South years ago, was no other than Texas fever, carried and distributed by the common cattle tick (*Margaropus annulatus*). The losses of cattle brought South were particularly heavy, because most of the animals shipped in were near maturity, and the disease is much more severe on mature than on very young animals. The methods of eradication used were rotation of pastures and the dipping or spraying of the animals with emulsions of crude oil and kerosene, or with an arsenical solution. At the beginning of this work there were 741,515 square miles of infected territory. From that time until November 1, 1913, 198,802 square miles of land have been actually freed of the tick, and at the present time the work is being carried on in every Southern State. The work of eradication and disinfection has cost the Federal Government less than $10 per square mile. As the loss to the South each year caused by cattle ticks has been estimated at $40,000,000, the importance of the work can be realized. The work is progressing very rapidly in Oklahoma, Arkansas, Mississippi, and Georgia. On October 1, 1913, the eradication work was being carried on in 26 counties in Mississippi and the building of dipping vats and educational work was being conducted in 15 other counties. The great importance of this work to the beef industry can hardly be estimated without taking into consideration the increased prices southern cattle will bring when they can be shipped above the quarantine line for feeding and breeding purposes, as well as the facts that cattle in a "free" area will grow much faster, the loss from Texas fever will be eliminated, and the farmers can readily bring in good breeding stock without danger of loss.

That tick eradication is doing much good may be illustrated by two farms which had been infected with ticks until two years ago and had never been able to sell their calves for more than $12 or $13 per head. In the fall of 1912,

after their premises had been "clean" for almost a year, they sold their entire bunch of heifer calves at $35 per head for breeders. These calves were high-grade Angus and were of a quality that would have been a credit to any farm. Then, too, fat steers from the "clean" area are permitted to be sold in the native pens at the market, and usually bring at least half a cent more per pound than if they had been sold from the quarantine pens.

Although good cattle have been raised in the South on tick-infested areas, far better ones are being raised on lands which have been freed of ticks, the losses from Texas fever are avoided, and the cattle industry is now more profitable than it has ever been before. All farmers should encourage and help in the eradication of the cattle tick, which is the greatest drawback to the industry of the South.

RAISING CATTLE.

As stated before, the native southern cattle are not large in size and are slow in growth. However, when these animals, which have become accustomed to taking care of themselves throughout practically the whole year, are bred to a pure-bred bull, the resulting calves look very much more like the sire than like the native cows. In fact, many half-breed animals make very desirable beef. When these grades have received a second or third infusion of beef blood, the progeny are usually about as desirable for beef purposes as the animals of still higher grade. The cattle of the South can be improved very rapidly by the use of pure-bred bulls, but the breeding of native cows to good beef animals has not been rapid because formerly the majority of the beef bulls were brought in from the North and a large percentage of them were lost from Texas fever, whereas many cattle raised in the South get the fever when young and the death rate among them is not nearly so large as when mature cattle first become infected with ticks. (See Pls. XXXVII, XXXVIII, and XXXIX.)

The cost of raising cattle in the South was determined in an experimental way by the department in coöperation with the Alabama experiment station. The results of those investigations are presented in Bureau of Animal Industry Bulletin 131. It was found that when pasturage was charged to the animal at the rate of 50 cents per month, when the winter feed

consumed was charged at prevailing market prices, when taxes, insurance, fencing, and repairs were considered, when insurance was maintained on the animals, and when the manure produced was credited at $1.25 per ton, the cost of raising animals to the age of 12 months, 24 months, 30 months, and 33 months was $2.35, $2.28, $2.39, and $2.31 per 100 pounds, respectively. When all of the expenses were charged against the animals and no credit was made for the manure the expense of producing a steer to the age of 12, 24, 30, and 33 months was $5.25, $4.96, $5.05, and $5 per 100 pounds, respectively. That is, if the animals are sold at the above prices the feeds consumed are marketed at a good farm price, $2.50 an acre is secured as rent for the summer pasture, all losses by death are accounted for, 7 per cent interest is secured on the capital invested in the herd, and the manure is secured free. To realize such profits it is essential that good cattle be raised. The scrub is a cheap animal, which never sells well because of his poor killing qualities, and he can not be raised to advantage.

The cattle which were raised in this experiment could have been produced cheaper in other portions of the South. Upon a great number of farms it is possible to produce winter pasture for cattle and reduce the cost of wintering them. This was not done on the test farm, and the cattle had the winter range alone. By the use of bur clover and Bermuda grass the pasture season can be extended about two months in the year. Farmers in the extreme South can have grazing the year through by the use of Bermuda, paspalum, carpet grass, bur clover, lespedeza, and velvet beans. Then, too, the cattle produced in this test were infested with the cattle tick, which not only retarded the growth of the animals materially, but caused several deaths from Texas fever. These losses naturally increased the cost of production. The Federal Government and the Southern States are now cooperating in the work of exterminating the tick, and when this is accomplished larger and better cattle can be raised.

In a later experiment [1] high-grade Angus and Shorthorn cows were used in a breeding test to determine the cost of raising calves in western Alabama. These cows were run on pasture from the middle of April to the latter part of September, and were then run in the stalk fields until January

[1] Department of Agriculture Bulletin 73.

20. During the rest of the winter they had the run of the whole plantation, on which was considerable switch cane, and they were given a small quantity of cottonseed cake each day. The cane and the woods furnished ample protection from the cold and all of the cows passed through the winter in good condition. They were again put on pasture April 14, and the feeding of a small amount of cake was continued until May 7, when the pastures were good and the grass was strong. All of the cows were bred to Aberdeen-Angus bulls.

The calves were dropped during January, February, March, and April. They nursed their dams until September 25, when they were taken away and put into a cornfield where there was a good growth of crab grass and cowpeas besides the cornstalks from which the corn had been snapped. On October 7 they were transferred to a peanut field to graze off the tops. They were changed from this to other cornstalk fields and on October 28 they were started on a ration of 1 pound of cottonseed cake each, which was gradually increased to 2 pounds per head per day. They were fed in this manner until January 16, at which time they averaged about 9½ months of age, and the average weight was 460 pounds. When pasturage had been charged for them as well as their dams for one year, when the amount of cottonseed cake consumed by both the cows and the calves was charged at market prices, when taxes had been paid on the cattle, and when 6 per cent interest on the cattle as well as the cost of labor and 10 per cent depreciation in value of the herd had been allowed, the average cost of the 64 calves produced to the average age of 9½ months was $14.36 per head, or $3.12 per hundred pounds.

The calves were then put in a dry lot and carried until April 1 on a ration of corn silage, sedge-grass hay, and cottonseed meal. At this time they averaged about 12 months of age and weighed 560 pounds each. The cost of producing them was $20.24 per head, or $3.61 per hundredweight, and they were sold at a net profit of $6.81 each after all of the above expenses had been paid and no account taken of the manure produced.

These cattle had been kept free of the cattle tick and at all times were thrifty. The male calves were castrated while very small. Feeds were charged at the following prices per

ton: Cottonseed cake, $26; cottonseed meal, $26; corn silage, $3; and sedge-grass hay, $5.

With the large areas available, the South should raise a great many breeding cattle. By the use of bulls of one breed in localities, each State could build up a trade for breeding and feeding cattle in the same manner that has been done in Texas. Although it is usually thought to be more profitable for the farmer to finish the cattle on the farm, there will be many who prefer selling off grass in preference to feeding them for the market. These men are the ones who may build up the trade for feeders to be sent to the corn belt as soon as the southern territory has been released from quarantine. Breeding stock even of the present quality is selling at a premium throughout the South, and many thousands of the native cattle from Louisiana, Mississippi, Alabama, Georgia, and Florida have been shipped into Oklahoma and western Texas to help replenish the depleted ranges. If the western cattlemen can afford to pay good prices for these animals and then pay the enormous freight rates to the western country, it seems that the southern farmer could make money by keeping these cattle on his own farm and by the use of good beef bulls raise cattle which could be sent direct to the market.

FINISHING CATTLE FOR MARKET.

In case the farmer wishes to finish his animals for market there are a number of methods which may be followed. He may finish his cattle during the winter and sell them as calves, yearlings, or mature stock, or he may finish his steers by feeding them on pasture during the summer. If the first method is to be followed, he should utilize the roughage on the farm, such as hay, stover, and corn silage, and he may feed some corn or may use cottonseed meal as the sole concentrate. Cattle which are finished during the latter part of the winter usually sell for a higher price per pound than those which are finished during the summer months. This is essential to the farmer, too, for the cost of the roughage during winter fattening is so much greater than grass that otherwise money would be lost in the transaction.

In 1904 the Bureau of Animal Industry began a series of experiments in feeding beef cattle in cooperation with the Alabama experiment station. The first three years' work

FIG. 1.—BREEDING-COWS ON PASTURE IN MISSISSIPPI.
(Courtesy of the Mississippi Experiment Station.)

FIG. 2.—AN ALABAMA BEEF HERD ON NATURAL PASTURE.

FIG. 1.—PORTION OF A HERD OF BREEDING-COWS ON AN ALABAMA FARM.

(These cows are the first and second crosses from purebred bulls on native scrub cattle.)

FIG. 2.—TENNESSEE STEERS IN THE FEED LOT.

(Courtesy of the Tennessee Experiment Station.)

FIG. 1.—WINTERING STEERS IN THE SOUTH.

(Courtesy of the Tennessee Experiment Station.)

FIG. 2.—SHORTHORN CALVES RAISED ON A TICK-FREE FARM IN TENNESSEE.

(Courtesy of Lespedeza Farm.)

FIG. 1.—A MISSISSIPPI RAISED BULL CALF. NOTE THE WONDERFUL THICKNESS OF FLESH.

(Courtesy of La Vernet Farm.)

FIG. 2.—A YEARLING BULL RAISED IN MISSISSIPPI. THIS IS THE TYPE TO USE IN IMPROVING NATIVE SOUTHERN CATTLE.

(Courtesy of La Vernet Farm.)

consisted of experimental tests of various southern feeds for finishing cattle in the dry-lot during the winter.[1] These experiments show conclusively that cottonseed meal was the cheapest and best concentrate that could be used in the South at that time, and prices on corn and cottonseed are still such that it is equally true at the present time. The cottonseed meal proved slightly more efficient for producing gains in weight than did corn-and-cob meal, and the gains were produced more cheaply. Cottonseed proved equal, pound for pound, to corn-and-cob meal, but the prices of cottonseed have advanced so rapidly since the time of these experiments that it is no longer profitable to feed it. Corn stover has not proven profitable to feed as the sole roughage to fattening cattle. The cattle do not seem to eat as much of it as they should, and they make smaller daily gains, require more concentrate to make a pound of gain, do not finish out as well, nor yield as fine carcasses as cattle fed on cottonseed hulls. Cottonseed hulls proved more profitable as a roughage than did sorghum, corn stover, or hays, when the market prices of each were taken into consideration. Hulls have increased in value so much that this probably no longer holds true. This was indicated by the South Carolina experiment station [2] in a test made in 1912, in which the lots fed on corn stover and corn silage made greater profits than did those which received cottonseed hulls as the sole roughage.

In the Alabama work the average of three years showed that steers fed under shelter made slightly larger and cheaper gains than did cattle fed in the open lot without shelter, but this difference in cost was not great enough to pay for the upkeep of expensive feeding sheds. In a later experiment [3] carried out by this bureau in cooperation with the Alabama station a test was made to determine whether or not it would be profitable for the southern farmer to build sheds for feeding purposes when it was desired to save all the manure possible by the use of plenty of bedding. It is known that on most farms there is some dry ground upon which the cattle may lie without shelter, as they are not always confined to small lots. Such was the case in this test. The cattle had some protection from the elements by

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[1] Bureau of Animal Industry Bulletin 103. [3] Bureau of Animal Industry Bulletin 159.
[2] South Carolina Bulletin 169.

a grove of pine trees and found high knolls upon which to lie down in rainy weather. This test showed that under such conditions the maintenance of a shelter was not profitable for the fattening process alone, as the shelter made a saving of but 6 cents per 100 pounds of gain made on mature animals, while the former Alabama experiments showed a net saving of but 9 cents per 100 pounds of gain during three years when animals were confined in small lots. Often a large amount of the manure produced in a test where cattle are fed on a large area is wasted, as it is dropped in undesirable places, and it loses much in fertility by being exposed to the weather. This can be overcome by feeding cattle in cultivated fields which contain no waste land, and which may be plowed two or three times during the winter in order to turn under the manure produced. If, however, this method can not be followed and the primary object of the feeding is that manure may be secured, it will undoubtedly pay to feed in small lots with spacious sheds that are kept well bedded. During the first feeding tests carried on by this bureau and the Alabama station, as reported in Bureau of Animal Industry Bulletin 103, corn silage was not used, but in later tests a comparison of cottonseed hulls, corn silage, and Johnson grass hay were made.[1]

All of the steers used in this experiment were grades of the beef breeds and were 2 and 3 year olds. Cottonseed meal was the sole concentrate fed. The steers which received silage made satisfactory daily gains and were better finished than either of the other lots of cattle. They were also more profitable, making a clear profit of $7.68, as compared to $6.97 for the cattle receiving hulls and $5.50 for the ones receiving Johnson-grass hay. The South Carolina experiment station made a feeding test showing the comparative feeding values of some southern roughages, the results of which are shown in South Carolina Bulletin 169, from which Smith may be quoted as follows:

> Our experiments with these 3 carloads of cattle indicate clearly that corn silage and stover are equally as valuable as hulls for feeding beef cattle and much more profitable to feed. * * * With cottonseed meal at $24 per ton and freight charges at $100 on the 60 cattle, lot No. 1 paid $6.86 per ton for silage, lot No. 2 paid $7.91 per ton for stover, and lot No. 3 paid $7 per ton for hulls. The prices obtained for silage and stover are fully double the

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[1] Bureau of Animal Industry Bulletin 159.

cost of production, thus leaving the farm a good profit for growing them. The cattle fed silage made greater and cheaper gains than the other two lots and took on a better finish. The cattle fed stover made slightly better gains than the lot fed on hulls, and at less cost. * * * With good silage and cottonseed meal at a reasonable price, the opportunities for feeding beef cattle profitably are unexcelled in any other section of the country.

The Tennessee experiment station[1] has found silage to be the most profitable roughage which they have tried, both for feeding stockers through the winter and finishing steers in the feed lot.

The Virginia experiment station found that silage was the most economical and profitable feed which was tried during the years 1905–1907. With reference to the silage-fed cattle, Soule[2] is quoted thus: "As this lot of cattle dressed out 56.9 per cent of meat of fine quality in which the fat and lean were well blended and equal to that from western bullocks, fed on corn, there is no justification for the opposition to the use of silage for finishing beef cattle." The Virginia experiment station has also found that no roughages they have used have proven so valuable for wintering stockers as corn silage and corn stover.[3]

Experiments covering a period of five years were made at the North Carolina experiment station and silage was used during each test. Taking these tests as a whole, the silage-fed cattle made cheaper gains, sold for a higher price, and returned a greater net profit than steers fed cottonseed hulls.[4] Similar results were secured in Texas when milo maize silage was compared with cottonseed hulls.[5]

The Texas experiment station[6] found it profitable at times to use molasses in conjunction with corn, cottonseed meal, and cottonseed hulls for cattle feeding. The use of kafir corn was found more profitable than the use of corn in supplementing rations of cottonseed hulls and cottonseed meal.

CALF FEEDING.

The finishing of calves for market has become an important item for the consideration of the farmer and cattleman. During the years of 1909, 1910, 1911, and 1912 the Bureau of Animal Industry, in cooperation with the Alabama experiment station, fed out four different herds of calves for the market.

[1] Tennessee Bulletin 3, Vol. XV.
[2] Virginia Bulletin 173, p. 121.
[3] Virginia Bulletin 164.
[4] North Carolina Bulletins 218 and 222.
[5] Texas Bulletin 153.
[6] Texas Bulletin 97.

All of the calves were taken from their mothers when from 6 to 8 months of age and immediately put on feed. The first lot of calves were started on feed December 3, 1909, and averaged 386 pounds. They were fed in a dry lot on cottonseed meal, corn chop, cottonseed hulls, and mixed alfalfa hay until March 24, 1910. During this period of 112 days they gained 126 pounds each, or 1.13 pounds per day. They were then turned on good pasture and fed cottonseed cake and alfalfa hay for 89 days. They did very well on the pasture and made a daily gain of 1.33 pounds per head. The gains made during the winter months cost $8.63 per hundred pounds, while the gains made on pasture cost $4.84 per hundredweight, or practically half as much. The calves were 14 to 15 months old when sold and averaged 628 pounds. When slaughtered, they produced fine carcasses well covered with fat, and the fat was evenly interspersed with the lean, giving a nice "marbled" effect. They killed out 54.4 per cent of marketable meat by their farm weights. After paying for all feeds at market prices and pasturage at 50 cents per head per month, they returned a net profit of $1.84 per head, without considering the manure produced.

The following year three lots of high-grade beef calves, 77 head in all, were fed to determine if it would be profitable to feed corn in conjunction with a ration made up of cottonseed hulls, alfalfa hay, and cottonseed meal; and what proportion of the grain ration should consist of corn. Each of the three lots received cottonseed hulls and alfalfa hay as roughage, while the concentrate given them was as follows: Lot I, cottonseed meal; lot II, two-thirds cottonseed meal, one-third corn and cob meal; lot III, one-third cottonseed meal, two-thirds corn-and-cob meal.

The calves were taken from their mothers November 17 and started on feed. They were fed for 120 days, at the end of which time they were shipped to the Cincinnati market. During the feeding period each calf in lots I, II, and III made an average daily gain of 1.71, 1.76, and 1.83 pounds, respectively, while the costs of the gains were $6.22, $6.19, and $6.83 per 100 pounds, respectively. The daily gains were satisfactory for animals of this size. These calves paid for all feeds at market prices, and made a net profit of $1.84, $2.25, and $1.48 in lots I, II, and III, respectively, without considering the manure.

Another bunch of 52 calves, which were not as good in quality, were fed on cottonseed meal, cottonseed hulls, and cowpea hay. The daily gain made by each of these calves for the 112 days they were fed was 1.24 pounds, and the cost of 100 pounds of gain was $6.97. They made a net profit of $3.50 per head besides the manure. The daily gains were not as large and were more expensive with these calves than with the calves of better quality in the other test, but they were sold on a better market and thus made a larger profit per head.

In 1911 and 1912 another test[1] was made to determine the cost of raising the calves and the profits of finishing them on the farm. When all legitimate charges were made against the calves for their keep, as well as that of their dams, the cost of raising to 9 months of age or weaning time proved to be 3 cents per pound. These calves, numbering 49 head, were fed on cottonseed meal, corn silage, and sedge-grass hay for 16 days in a preliminary period and 76 days in the regular feeding period. The silage was of good quality, but the hay, being composed of broom sedge and lespedeza, such as is commonly used on many farms in the South, was poor in quality.

The calves did well during the whole feeding period. They made a daily gain of 1.37 pounds at a cost of $5.22 per hundredweight. At the close of the test they would have classed as choice to prime on the market, but they were sold on the farm, bringing 5½ cents per pound and making a net profit of $9.56 per head.

There was little difference in the amount of the gains of the heifer and steer calves, but the heifer calves usually fattened better, as there was a more pronounced tendency on the part of the steer calves to grow than to fatten rapidly.

In all of the feeding experiments a profit was made by finishing the calves. More money was made by finishing them than would have been realized if they had been sold at weaning time without feeding, for there is no doubt that many farmers sell their calves or yearlings at a price which is actually less than it cost to raise them. It was found to be more profitable to feed the calves in the dry lot and finish them in a short time than to feed them all winter and finish by feeding on grass the following summer. The use

[1] Department of Agriculture Bulletin 73.

of alfalfa hay or cowpea hay in conjunction with cottonseed hulls was beneficial.

While profits were made on the calves of every experiment conducted, it does not follow that all farmers should fatten out their surplus stock as calves. Farm and market conditions may be such that many farmers will find it more profitable to raise their cattle to maturity before finishing them, while others will find it to be better policy to feed them out as calves or yearlings. It must be remembered that calves which can be profitably finished for market must be high in quality and well bred; otherwise they will not fatten properly, but will grow instead, and they will not sell to advantage. Then, too, far greater care must be used in feeding calves than older cattle, as they are easier to go off feed, and it is harder to get them to doing well again if they suffer from this common complaint.

FEEDING CATTLE ON PASTURE.

Within the last few years the feeding of beef cattle on pasture has aroused considerable interest among the farmers of the Southern States. This is due partly to the increased cost of cottonseed hulls, which formerly constituted the principal roughage used in winter feeding, and partly from the realization that summer feeding is a safer proposition financially than winter feeding. The tests in summer feeding in Alabama have been in progress since 1907.[1] In order that there would be little chance of error in the results secured because of the individuality of one or two animals, a carload or more of steers were used in each lot of the various tests. Each year one lot of cattle were grazed on pasture without feed in order that a comparison might be secured between this method and that of feeding the cattle on pasture.

The cattle which received feed in addition to the grass made greater daily gains than the grass cattle. The gains in each case were satisfactory, those of the grass cattle varying from 1.52 to 1.75 pounds per steer per day, while the daily gains of the fed cattle varied from 1.84 to 2.32 pounds per steer. The cattle which received pasture alone made cheap gains each year, the cost of 100 pounds of gain

[1] See Bureau of Animal Industry Buls. 131, 159, and Department of Agriculture Bulletin 73; also Alabama Bulletins 150, 151, 163.

ranging from \$1.02 to \$1.18 when pasture was charged at 50 cents per steer per month. The cost of the increased weight of the cake-fed cattle varied from \$2.56 to \$4.02 per 100 pounds. When compared to the cost of gains made by cattle fed in the winter these gains seem very cheap, as winter gains usually cost from \$8 to \$14 per hundred pounds. While the grass steers made gains much cheaper than the cake-fed steers, it does not follow that they were the most profitable. The selling price of the cake-fed steers was enough greater than that of the straight grass steers to pay the difference in the cost of the gains and return a much larger profit. This difference in selling price usually ranged from 0.5 to 1 cent per pound. The profits upon the steers which received grass alone varied from \$2.86 to \$6.84 per head, while the profits on the fed cattle ranged from \$4.18 to \$11 per head, depending upon the year the feeding was done and upon the feeds used to supplement the pastures.

When cotton seed sold for \$14 and cottonseed cake for \$26 per ton, as was the case in 1909, greater profits were returned by the steers fed upon cotton seed. Contrary to the general belief, the cotton seed did not cause the cattle to scour while upon grass, but greater care had to be exercised by the feeder when using cotton seed than when feeding cake. The steers fed on cotton seed did not seem to relish the feed as well as the steers fed on cake, about the middle of the summer, and it was hard to keep the steers eating the cotton seed at this time.

"Cold process" cottonseed cake did not produce as large daily gains nor as great profits per steer as the ordinary cottonseed cake, when the former cost \$23 and the latter \$26 per ton. There was a difference of 18 cents per hundred pounds in the selling price of the steers in favor of those fed on cottonseed cake.

The feeding of well-fleshed steers on a heavy ration of cottonseed cake in order that they might be finished for the market by July 1 has proven more profitable than the feeding of a medium ration of cake for a longer period. The profit realized per steer by each method was \$8.30 and \$7.73, respectively.

The principal advantages of finishing the cattle early in the summer are: (1) The cattle do not come in competition with so many fat grass cattle, and they sell at such prices that they

are more profitable than cattle sold later in the season; (2) the cattle are taken off the pasture in July and it is permitted to grow up for late fall pasture for other animals; and (3) the money invested in the feeding operations is not tied up for so long a period.

A lot of 54 native Alabama scrub steers of various sizes and ages were fed on pasture in the same manner as a lot of good grade beef steers. The scrub steers cost one-half a cent less per pound at the beginning of the experiment and made a profit of but 43 cents per head, while the grade steers realized a profit of $10.42 each. The scrub steers made satisfactory gains on pasture, but the quality of the cattle was such that they did not sell for nearly so much as the grade steers of the beef breeds. The better the quality of the steers to be fed, the better are the chances of making good profits, provided the purchase price is not widely different on the two classes.

The summer feeding of cattle has been profitable in every test made except one, in which the cattle were fed during the whole winter before turning upon grass. The grass was "slushy" during the entire grazing season, due to excessive rains and the fact that the pasture was on low land. Satisfactory gains could not be expected under such conditions.

The margin of profit necessary to break even is far smaller during the summer feeding than during winter feeding. The summer feeding of steers is a safer proposition and more money is usually realized than by finishing the steers during the winter. Summer feeding is especially urged upon those farmers who have available pastures and who are not in a position to raise all of the feeds necessary for winter feeding upon the farm. The manure will not be available for the crops, however, as in the case of winter feeding, for it will be scattered about the pasture.

Some steers were fed at the Mississippi experiment station during the summer of 1909, but the pastures were poor; consequently the daily gains were small, being but 1.25 pounds per head. The cost of the summer gains were $5.38 per hundredweight as compared to $6.49 per hundredweight for the winter feeding. Larger profits were secured than by winter feeding and it was conceded to be a safer practice.[1]

[1] Mississippi Bulletin 136.

That much interest is being taken in the beef-cattle industry in the South is shown by the large number of farmers who are buying pure-bred cattle for the first time, by the scarcity of good grade beef cows and the readiness with which they sell when offered, and by the great increase in the number of silos which are being erected by the owners of beef cattle. In 12 counties in Mississippi that have eradicated the cattle tick there have been purchased in 6 months over 400 pure-bred beef bulls and 1,000 pure-bred beef cows, representing a cash expenditure of over $200,000. These cattle have been purchased largely by small farmers. In South Carolina, county live-stock associations are being formed and one breed of beef cattle is decided upon, in order to create a breeding center for that breed and to secure a uniform product. Of the number of prospective silos to be built in Alabama during 1914, over 70 per cent are to be for farmers who are raising beef cattle. In the Texas Panhandle many silos are being dug or erected. The cattle raiser of that section has decided he should finish his cattle for the market, and a great change in methods will probably be seen there within five years. In other Southern States pure-bred cattle are being purchased, silos and barns are being built, preparations are being made to raise greater amounts of feed, and plans are being made for the feeding of more cattle. There are signs of progress everywhere and the growth of the entire industry seems assured. The result of all this will be an increase in the fertility of the soil and the foundation of a permanent system of soil improvement.

The farmers of the whole South will eventually realize two important facts: (1) That more live stock should be kept on every southern farm, and (2) if these stock are beef cattle each of them should be finished for the market before selling in order to secure the greatest profits. Whether these animals should be fattened during the winter or the summer will depend largely upon local conditions. One of the most important factors to consider when debating whether to feed cattle during the summer or the winter is the need of immediate applications of manure to the cultivated lands. If the fields are poor and manure is needed upon them at once, it may pay to finish cattle during the winter, for cattle which are fed during the summer drop the manure over the

pasture lands and little is saved to haul to the cultivated fields. The manure on the pasture will stimulate the growth of the grasses, however, and increase the "carrying capacity" of the pasture, and if the pastures are put in cultivation later the effects of the manure will be apparent.

The greatest need of the southern soils is barnyard manure, the application of which always increases the yields of the subsequent crops, regardless of the type of the soils to which it is applied. Cotton responds very readily to stable manure, in fact, far more readily than either corn or oats, and this in itself is a great item in favor of live stock, for cotton is and probably always will be the staple crop of the South, and an increased yield per acre means greater profits to the farmer. By raising live stock the soil is improved by the growing of leguminous pasture grasses, of nitrogen-gathering forage crops, by the return of the manure to the land, and by abandoning the one-crop system, which is the worst form of soil robbery.

HEMP.

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INTRODUCTION.

THE two fiber-producing plants most promising for cultivation in the central United States and most certain to yield satisfactory profits are hemp and flax. The oldest cultivated fiber plant, one for which the conditions in the United States are as favorable as anywhere in the world, one which properly handled improves the land, and which yields one of the strongest and most durable fibers of commerce, is hemp. Hemp fiber, formerly the most important material in homespun fabrics, is now most familiar to the purchasing public in this country in the strong gray tying twines one-sixteenth to one-fourth inch in diameter, known by the trade name "commercial twines."

NAME.

The name "hemp" belongs primarily to the plant *Cannabis sativa.* (Pl. XL, fig. 1.) It has long been used to designate also the long fiber obtained from the hemp plant. (Pl. XL, fig. 4.) Hemp fiber, being one of the earliest and best-known textile fibers and until recent times the most widely used of its class, has been regarded as the typical representative of long fibers. Unfortunately, its name also came to be regarded as a kind of common name for all long fibers, until one now finds in the market quotations "Manila hemp" for abacá, "sisal hemp" for sisal and henequen, "'Mauritius hemp" for Furcraea fiber, "New Zealand hemp" for phormium, "Sunn hemp" for Crotalaria fiber, and "India hemp" for jute. All of these fibers in appearance and in economic properties are unlike true hemp, while the name is never applied to flax, which is more nearly like hemp than any other commercial fiber.

The true hemp is known in different languages by the following names: *Cannabis,* Latin; *chanvre,* French; *cañamo,*

Spanish; *canhamo,* Portuguese; *canapa,* Italian; *canep,* Albanian; *konopli,* Russian; *konopj* and *penek,* Polish; *kemp,* Belgian; *hanf,* German; *hennup,* Dutch; *hamp,* Swedish; *hampa,* Danish; *kenevir,* Bulgarian; *ta-ma, si-ma,* and *tse-ma,* Chinese; *asa,* Japanese; *nasha,* Turkish; *kanabira,* Syrian; *kannab,* Arabic.

IMPORTANCE OF HEMP.

Hemp was formerly the most important long fiber, and it is now used more extensively than any other soft fiber except jute. From 10,000 to 15,000 tons are used in the United States every year. The approximate amount consumed in American spinning mills is indicated by the following table, showing the average annual importations [1] and estimates of average domestic production of hemp fiber for 35 years:

Average annual imports and estimates of average annual production of hemp fiber in 5-year periods from 1876 to 1910, inclusive, and from 1911 to 1913, inclusive.

Years.	Imports.	Production in United States.	Total.
	Tons.	*Tons.*	*Tons.*
1876 to 1880	459	7,396	7,855
1881 to 1885	5,393	5,421	10,814
1886 to 1890	10,427	8,270	18,697
1891 to 1895	4,962	5,631	10,593
1896 to 1900	4,985	5,177	10,162
1901 to 1905	4,577	6,175	10,752
1906 to 1910	6,375	5,150	11,525
1911 to 1913	5,982	5,100	11,082

There are no statistics available, such as may be found for wheat, corn, or cotton, showing with certainty the acreage and production of hemp in this country. The estimates of production in the foregoing table are based on the returns of the Commissioner of Agriculture of Kentucky for earlier years with amounts added to cover the production in other States, and on estimates of hemp dealers for more recent years. While these figures can not be regarded as accurate statistics, and they are probably below rather than above the actual production, especially in the earlier years,

[1] Computed from reports of the Bureau of Navigation and Commerce, U. S. Treasury Department, and Bureau of Statistics, Department of Commerce.

they indicate a condition well recognized by all connected with the industry. The consumption of hemp fiber has a slight tendency to increase, but the increase is made up through increased importations, while the domestic production shows a tendency toward reduction.

PRODUCTION IN UNITED STATES DECLINING.

This falling off in domestic production has been due primarily to the increasing difficulty in securing sufficient labor to take care of the crop; secondarily, to the lack of development of labor-saving machinery as compared with the machinery for handling other crops and to the increasing profits in raising stock, tobacco, and corn, which have largely taken the attention of farmers in hemp-growing regions.

The work of retting, breaking, and preparing the fiber for market requires a special knowledge, different from that for handling grain crops, and a skill best acquired by experience. These factors have been more important than all others in restricting the industry to the bluegrass region of Kentucky, where the plantation owners as well as the farm laborers are familiar with every step in handling the crop and producing the fiber.

An important factor, tending to restrict the use of hemp, has been the rapidly increasing use of other fibers, especially jute, in the manufacture of materials formerly made of hemp. Factory-made woven goods of cotton or wool, more easily spun by machinery, have replaced the hempen "homespun" for clothing; wire ropes, stronger, lighter, and more rigid, have taken its place in standing rigging for ships; abacá (Manila hemp), lighter and more durable in salt water, has superseded it for towing hawsers and hoisting ropes; while jute, inferior in strength and durability, and with only the element of cheapness in its favor, is usurping the legitimate place of hemp in carpet warps, so-called "hemp carpets," twines, and for many purposes where the strength and durability of hemp are desired.

The introduction of machinery for harvesting hemp and also for preparing the fiber, together with the higher prices paid for hemp during the past three years, has aroused an interest in the industry, and many experiments are being tried with a view to the cultivation of the crop in new areas.

BOTANICAL STUDY OF HEMP

THE PLANT.

The hemp plant, *Cannabis sativa* L.,[1] is an annual, growing each year from the seed. It has a rigid, herbaceous stalk, attaining a height of 1 to 5 meters (3 to 16 feet), obtusely 4-cornered, more or less fluted or channeled, and with well-marked nodes at intervals of 10 to 50 centimeters (4 to 20 inches). When not crowded it has numerous spreading branches, and the central stalk attains a thickness of 3 to 6 centimeters (1 to 2 inches), with a rough bark near the base. If crowded, as when sown broadcast for fiber, the stalks are without branches or foliage except at the top, and the smooth fluted stems are 6 to 20 millimeters ($\frac{1}{4}$ to $\frac{3}{4}$ inch) in diameter. The leaves, opposite, except near the top or on the shortened branches, appearing fascicled, are palmately compound and composed of 5 to 11—usually 7—leaflets. (Pl. XLI, fig. 1.) The leaflets are dark green, lighter below, lanceolate, pointed at both ends, serrate, 5 to 15 centimeters (2 to 6 inches) long, and 1 to 2 centimeters ($\frac{3}{8}$ to $\frac{3}{4}$ inch) wide. Hemp is diœcious, the staminate or pollen-bearing flowers and the pistillate or seed-producing flowers being borne on separate plants. The staminate flowers (Pl. XL, fig. 2) are borne in small axillary panicles, and consist of five greenish yellow or purplish sepals opening wide at maturity and disclosing five stamens which discharge abundant yellow pollen. The pistillate flowers (Pl. XL, fig. 3) are stemless and solitary in the axils of the small leaves near the ends of the branches, often crowded so as to appear like a thick spike. The pistillate flower is inconspicuous, consisting of a thin, entire, green calyx, pointed, with a slit at one side, but remaining nearly closed over the ovary and merely permitting the two small stigmas to protrude at the apex. The ovary is one seeded, developing into a smooth, compressed or nearly spherical achene (the "seed"), 2.5 to 4 millimeters ($\frac{1}{10}$ to $\frac{3}{16}$ inch) thick and 3 to 6 millimeters ($\frac{1}{8}$ to $\frac{1}{4}$ inch) long, from dark gray to light brown in color and mottled (Pl. XLI, fig. 2). The seeds cleaned for market nearly always include some still covered with the green, gummy calyx. The seeds vary in weight from 0.008 to 0.027 gram, the dark-colored seeds being generally much heavier than the light-colored seeds of the same sample. The light-colored seeds are often imperfectly developed. Dark-colored and distinctly mottled seeds are generally preferred.

The staminate plants are often called the flowering hemp, since the pistillate flowers are rarely observed. The staminate plants die after the pollen is shed, but the pistillate plants remain alive and green two months later, or until the seeds are fully developed.

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[1] Linnæus. Species Plantarum, ed. 1, 1027, 1753.

Dioscorides. Medica Materia, libri sex, p. 147, 1537.

Synonyms: *Cannabis erratica paludosa* Anders. Lobel. Stirpium Historia, 284, 1576.
Cannabis indica Lamarck. Encyclopaedia, 1: 695, 1788.
Cannabis macrosperma Stokes. Bot. Mat. Med., IV, 539, 1812.
Cannabis chinensis Delile. Ind. Sem. Hort. Monst. in Ann. Sci. Nat. Bot., 12: 365, 1849.
Cannabis gigantea Delile. L. Vilmorin. Rev. Hort., 5: s. 3, 109, 1851.

THE STALK.

The hemp stalk is hollow, and in the best fiber-producing types the hollow space occupies at least one-half the diameter. The hollow space is widest, or the surrounding shell thinnest, about midway between the base and the top of the plant. The woody shell is thickened at each node, dividing the hollow space into a series of partly separated compartments. (Pl. XLI, fig. 4.) If the stalk is cut crosswise a layer of pith, or thin-walled tissue, is found next to the hollow center, and outside of this a layer of wood composed of hard, thick-walled cells. This layer, which forms the "hurds," is a very thin shell in the best fiber-producing varieties. It extends clear across the stem below the lowest node, and in large, coarse stalks grown in the open it is much thicker and the central hollow relatively smaller. Outside of the hard woody portion is the soft cambium, or growing tissue, the cells of which develop into the wood on the inside, or into the bast and bark on the outside. It is chiefly through this cambium layer that the fiber-bearing bast splits away from the wood in the processes of retting and breaking. Outside of the cambium is the inner bark, or bast, comprising short, thin-walled cells filled with chlorophyll, giving it a green color, and long thick-walled cells, making the bast fibers. These bast fibers are of two kinds, the smaller ones (secondary bast fibers) toward the inner portion making up rather short, fine fibers, many of which adhere to the wood or hurds when the hemp is broken, and the coarser ones (primary bast fibers) toward the outer part, extending nearly throughout the length of the stalk. Outside of the primary bast fiber is a continuation of the thin-walled chlorophyll-bearing cells free from fiber, and surrounding all is the thin epidermis.

THE FIBER.

The hemp fiber of commerce is composed of the primary bast fibers, with some adherent bark and also some secondary bast fiber. The bast fibers consist of numerous long, overlapping, thick-walled cells with long, tapering ends. The individual cells, almost too small to be seen by the unaided eye, are 0.015 to 0.05 millimeter ($\frac{1}{1500}$ to $\frac{1}{500}$ inch) in diameter, and 5 to 55 millimeters ($\frac{3}{16}$ to $2\frac{1}{8}$ inches) long. Some of the bast fibers extend through the length of the stalk, but some are branched, and some terminate at each node. They are weakest at the nodes.

RELATIONSHIPS.

The hemp plant belongs to the mulberry family, Moraceæ, which includes the mulberry, the Osage orange, the paper mulberry, from the bast of which the tapa of the South Sea Islands is made, and the hop, which contains a strong bast fiber. Hemp is closely related to the nettle family, which includes ramie, an important fiber-producing plant of Asia, and several species of nettles having strong bast fibers.

The genus Cannabis is generally regarded by botanists as monotypic, and the one species *Cannabis sativa* is now held to include the half dozen forms which have been described under different names (see footnote, p. 286) and which are cultivated for different purposes. The foregoing description refers especially to the forms cultivated for the production of fiber.

HISTORY.

EARLY CULTIVATION IN CHINA.

Hemp was probably the earliest plant cultivated for the production of a textile fiber. The "Lu Shi," a Chinese work of the Sung dynasty, about 500 A. D., contains a statement that the Emperor Shen Nung, in the twenty-eighth century B. C., first taught the people of China to cultivate "ma" (hemp) for making hempen cloth. The name *ma* (fig. 17) occurring in the earliest Chinese writings designated a plant of two forms, male and female, used primarily for fiber. Later the seeds of this plant were used for food.[1] The definite statement regarding the staminate and pistillate forms eliminates other fiber plants included in later times under the Chinese name *ma*. The Chinese have cultivated the plant for the production of fiber and for the seeds, which were used for food and later for oil, while in some places the stalks are used for fuel, but there seems to be no record that they have used the plant for the production of the narcotic drugs bhang, charas, and ganga. The production and use of these drugs were developed farther west.

FIG. 17.—Chinese character *ma*, the earliest name for hemp.

CULTIVATION FOR NARCOTIC DRUGS.

The use of hemp in medicine and for the production of the narcotic drug Indian hemp, or cannabis, is of interest in this paper only because of its bearing on the origin and development of different forms of the plant. The origin of this use is not definitely known, but the weight of evidence

[1] Bretschneider, E. Botanicum Sinicum, in Journal of the North China Branch of the Royal Asiatic Society, n. s., v. 25, p. 203, 1893, Shanghai.

seems to indicate central Asia or Persia and a date many centuries later than its first cultivation for fiber. The name *bhanga* occurs in the Sanskrit "Atharvavéda" (about 1400 B. C.), but the first mention of it as a medicine seems to be in the work of Susruta (before the eighth century A. D.), while in the tenth century A. D. its intoxicating nature seems to have been known, and the name "indraçana" (Indra's food) first appears in literature.[1] A further evidence that hemp, for the production of fiber as well as the drug, has been distributed from central Asia or Persia is found in the common origin of the names used. The Sanskrit names "bhanga" and "gangika," slightly modified to "bhang" and "ganja," are still applied to the drugs, and the roots of these words, "ang" and "an," recur in the names of hemp in all of the Indo-European and modern Semitic languages, as bhang, ganja, hanf, hamp, hemp, chanvre, cañamo, kannab, cannabis.[2]

HEMP IN INDIA.

Northern India has been regarded by some writers as the home of the hemp plant, but it seems to have been unknown in any form in India before the eighth century, and it is now thought to have been introduced there first as a fiber plant. It is still cultivated to a limited extent for fiber in Kashmir and in the cool, moist valleys of the Himalayas, but in the warmer plains regions it is grown almost exclusively for the production of the drugs.[3]

Hemp was not known to the Hebrews nor to the ancient Egyptians, but in medieval times it was introduced into North Africa, where it has been cultivated only for the drug. It is known in Morocco as "kif," and a small form, 1 to 3 feet high, cultivated there has been described as a distinct variety, *Cannabis sativa kif*.[4]

INTRODUCTION INTO EUROPE.

According to Herodotus (about 450 B. C.), the Thracians and Scythians, beyond the Caspian Sea, used hemp, and it is probable that the Scythians introduced the plant into Europe in their westward migration, about 1500 B. C.,

[1] Watt, Sir George. Commercial Products of India, p. 251, 1908.
[2] De Candolle, Alphonse. Origin of Cultivated Plants, p. 148, 1886.
[3] Watt, Sir George. Commercial Products of India, p. 253, 1908.
[4] De Candolle, Alphonse. Prodromus, v. 16, pt. 1, p. 31, 1869.

though it seems to have remained almost unknown to the Greeks and Romans until the beginning of the Christian era. The earliest definite record of hemp in Europe is the statement that "Hiero II. King of Syracuse (270 B. C.), bought hemp in Gaul for the cordage of his vessels."[1] From the records of Tragus (1539 A. D.), hemp in the sixteenth century had become widely distributed in Europe. It was cultivated for fiber, and its seeds were cooked with barley and other grains and eaten, though it was found dangerous to eat too much or too frequently. Dioscorides called the plant *Cannabis sativa*, a name it has continued to bear to the present time, and he wrote of its use in "making the stoutest cords" and also of its medicinal properties.[2] Nearly all of the early herbalists and botanical writers of Europe mention hemp, but there is no record of any further introduction of importance in the fiber industry until the last century.

INTRODUCTION OF CHINESE HEMP INTO EUROPE.

In 1846 M. Hébert sent from China to the Museum at Paris some seeds of the "tsing-ma," great hemp, of China. Plants from this seed, grown at Paris by M. L. Vilmorin, attained a height of more than 15 feet, but did not produce seeds. In the same year M. Itier sent from China to M. Delile, of the Garden at Montpellier, France, seeds of a similar kind of hemp. These seeds were distributed in the southern part of France, where the plants not only grew tall, some of them measuring 21 feet, but they also produced mature seeds. M. Delile called this variety *Cannabis chinensis*[3] and the one from the seeds sent by M. Hébert he called *C. gigantea*.[4] These two forms of hemp were regarded as the same by M. L. Vilmorin, who states that they differ very much in habit from the common hemp of Europe, which was shorter and less valuable for fiber production. We are also told that this chanvre de Chine did not appear to be the same as the chanvre de Piedmont,[5] the tall hemp of eastern France and northern Italy, the origin of which has sometimes been referred to this introduction, but this

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[1] De Candolle, Alphonse. Origin of Cultivated Plants, p. 148, 1886.
[2] Dioscorides. Medica Materia, libri sex, p. 147, 1537.
[3] Delile, Raffenau. Index seminum horti botanici Monspeliensis. Ann. Sci. Nat. Bot., v. 12, p. 365, 1849.
[4] Vilmorin, L. Chanvre de Chine. Rev. Hort. 5: s. 3, p. 109, 1851.
[5] Pépin. Sur le chanvre de Chine. Rev. Hort. 1: s. 3, p. 190, 1847.

may have originated in a previous introduction, since *Cannabis chinensis* is mentioned as having been in the Botanical Garden at Vienna in 1827. In the same statement, however, *C. sativa pedemontana* is described as a distinct variety.[1] Particular attention is called to the introduction of this large Chinese hemp into Europe, since it was doubtless from the same source as the best hemp seed now brought from China to the United States.

INTRODUCTION INTO SOUTH AMERICA.

Hemp from Spain was introduced into Chile about 1545.[2] It has been largely grown in that country, but at present its cultivation is confined chiefly to the fertile lands in the valley of the Rio Aconcagua, between Valparaiso and Los Andes, where there are large cordage and twine mills. The fiber is all consumed in these mills.

INTRODUCTION INTO NORTH AMERICA.

Hemp was introduced into New England soon after the Puritan settlements were established, and the fact that it grew "twice so high" as it did in old England was cited as evidence of the superior fertility of the soil of New England.[3] A few years later a writer in Virginia records the statement that "They begin to plant much Hempe and Flax which they find growes well and good."[4] The cultivation of hemp in the New England colonies, while continued for some time in Massachusetts and Connecticut, did not attain as much importance as the cultivation of flax for supplying fiber for household industry. In the South hemp received more attention, especially from the Virginia Legislature, which passed many acts designed to promote the industry, but all in vain.[5]

The cultivation of hemp seems to have been a flourishing industry in Lancaster County, Pa., before the Revolution. An elaborate account of the methods then employed in

[1] De Candolle, Alphonse. Prodromus, v. 16, pt. 1, p. 31, 1869.

[2] Husbands, José D. U. S. Department of Agriculture, Bureau of Plant Industry, Bulletin 153, p. 42, 1909.

[3] Morton, Thomas. New English Canaan, p. 64, 1632. *In* Force, Peter, Tracts and Other Papers, v. 2, 1838.

[4] Virginia, printed for Richard Wodenoth, 1649. *In* Force, Peter, Tracts and Other Papers, v. 2, 1838.

[5] Moore, Brent. A Study of the Past, the Present, and the Possibilities of the Hemp Industry in Kentucky, p. 14, 1905.

growing hemp, written about 1775 by James Wright, of Columbia, Pa.,[1] was recently published as an historical document. The methods described for preparing the land were equal to the best modern practice, but the hemp was pulled by hand instead of cut. Various kinds of machine brakes had been tried, but they had all "given Way to one simple Break of a particular Construction, which was first invented & made Use of in this country." The brief description indicates the common hand brake still in use in Kentucky.

EARLY CULTIVATION IN KENTUCKY.

The first crop of hemp in Kentucky was raised by Mr. Archibald McNeil, near Danville, in 1775.[2] It was found that hemp grew well in the fertile soils of the bluegrass country, and the industry was developed there to a greater extent than it had been in the eastern colonies. While it was discontinued in Massachusetts, Virginia, and Pennsylvania, it has continued in Kentucky to the present time. In the early days of this industry in Kentucky, fiber was produced for the homespun cloth woven by the wives and daughters of the pioneer settlers, and an export trade by way of New Orleans was developed. In 1802 there were two extensive ropewalks in Lexington, Ky., and there was announced "a machine, moved by a horse or a current of water, capable, according to what the inventor said, to break and clean eight thousand weight of hemp per day."[3] Hemp was later extensively used for making cotton-bale covering. Cotton bales were also bound with hemp rope until iron ties were introduced, about 1865. There was a demand for the better grades of hemp for sailcloth and for cordage for the Navy, and the industry was carried on more extensively from 1840 to 1860 than it has been since.

EXTENSION OF THE INDUSTRY TO OTHER STATES.

Hemp was first grown in Missouri about 1835, and in 1840 1,600 tons were produced in that State. Four years later the output had increased to 12,500 tons, and it was thought that Missouri would excel Kentucky in the production of

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[1] New Era, Lancaster, Pa., June 24, 1905.

[2] Moore, Brent. A Study of the Past, the Present, and the Possibilities of the Hemp Industry in Kentucky, p. 16, 1905.

[3] Michaux, F. Andre. Travels to the west of the Alleghanies, p. 152, 1805. *In* Thwaites, Early Western Travels, v. 3, p. 200, 1904.

this fiber. With the unsatisfactory methods of cleaning the fiber on hand brakes and the difficulties of transporting the fiber to the eastern markets, hemp proved less profitable than other crops, and the industry was finally abandoned about 1890.

Hemp was first grown at Champaign, Ill., about 1875. A cordage mill was established there for making twines from the fiber, which was prepared in the form of long tow by a large machine brake. The cordage mill burned and the industry was discontinued in 1902 because there was no satisfactory market for the kind of tow produced.

In Nebraska, hemp was first grown at Fremont in 1887 by men from Champaign, Ill. A binder-twine plant was built, but owing to the low price of sisal, more suitable for binder twine, most of the hemp was sold to eastern mills to be used in commercial twines. After experimenting with machine brakes the company brought hand brakes from Kentucky and colored laborers to operate them. The laborers did not stay, and the work was discontinued in 1900. Some of the men who had been connected with the company at Fremont began growing hemp at Havelock, near Lincoln, in 1895. A machine for making long tow, improved somewhat from the one at Champaign, was built. Further improvements were made in the machine and also in the methods of handling the crop, but the industry was discontinued in 1910, owing to the lack of a satisfactory market for the kind of tow produced.

Hemp was first grown on a commercial scale in California at Gridley, in Butte County, by Mr. John Heaney, who had grown it at Champaign and who devised the machine used there for making long tow. Mr. Heaney built a machine with some improvements at Gridley, and after three disastrous inundations from the Feather River moved to Courtland, in the lower Sacramento Valley, where the reclaimed lands are protected by dikes. The work is now being continued at Rio Vista, in Solano County, under more favorable conditions and with a machine still further improved. The hemp fiber produced in California is very strong and is generally lighter in color than that produced in Kentucky.

In 1912 hemp was first cultivated on a commercial scale under irrigation at Lerdo, near Bakersfield, Cal., and a larger acreage was grown there in 1913. The seed for both crops was obtained in Kentucky.

INTRODUCTION OF CHINESE HEMP INTO AMERICA.

In 1857 the first Chinese hemp seed was imported. It met with such favor that some of this seed is said to have brought $10 per quart.[1] Since that time the common hemp of European origin has given place in this country to the larger and better types from China.

GEOGRAPHICAL DISTRIBUTION.

The original home of the hemp plant was in Asia, and the evidence points to central Asia, or the region between the Himalayas and Siberia. Historical evidence must be accepted rather than the collection of wild specimens, for hemp readily becomes naturalized, and it is now found growing without cultivation in all parts of the world where it has been introduced. Hemp is abundant as a wild plant in many localities in western Missouri, Iowa, and in southern Minnesota, and it is often found as a roadside weed throughout the Middle West. De Candolle[2] writes of its origin as follows:

> The species has been found wild, beyond a doubt, south of the Caspian Sea (De Bunge); in Siberia, near the Irtysch; and in the Desert of Kirghiz, beyond Lake Baikal, in Dahuria (Government of Irkutsh). It is found throughout central and southern Russia and south of the Caucasus, but its wild nature here is less certain. I doubt whether it is indigenous in Persia, for the Greeks and Hebrews would have known of it earlier.

Hemp is now cultivated for the production of fiber in China, Manchuria, Japan, northern India, Turkey, Russia, Austria-Hungary, Italy, France, Belgium, Germany, Sweden, Chile, and in the United States. It is grown for the production of the drugs bhang, ganja, kif, marihuana, hasheesh, etc., in the warm, arid, or semiarid climates of India, Persia, Turkey, Algeria, central and southern Africa, and in Mexico, and for the production of seed for oil in China and Manchuria.

In the United States hemp is now cultivated in the bluegrass region of Kentucky within a radius of 50 miles of Lexington; in the region of Waupun, Wis.; in northern Indiana; near Lima, Ohio; and at Lerdo and Rio Vista, Cal. There are numerous small experimental plats in other places.

The principal countries producing hemp fiber for export are Russia, Italy, Hungary, and Roumania. China and

[1] Moore, Brent. The Hemp Industry in Kentucky, pp. 60–61, 1905.
[2] De Candolle, Alphonse. Origin of Cultivated Plants, p. 148, 1886.

Japan produce hemp fiber of excellent quality, but it is nearly all used for home consumption. Hemp is not cultivated for fiber in the Tropics or in any of the warm countries.

The historical distribution of hemp, as nearly as may be traced from the records, and the areas where hemp is now cultivated are indicated in the accompanying map, figure 6.

VARIETIES.

Hemp, cultivated for three different products—fiber from the bast, oil from the seeds, and resinous drugs from the flowers and leaves—has developed into three rather distinct types or groups of forms. The extreme, or more typical, forms of each group have been described as different species, but the presence of intergrading forms and the fact that the types do not remain distinct when cultivated under new conditions make it impossible to regard them as valid species.

There are few recognized varieties in either group. Less than 20 varieties of fiber-producing hemp are known, although hemp has been cultivated for more than 40 centuries, or much longer than either cotton or corn, both of which now have hundreds of named varieties.

CHINA.

The original home of the hemp plant was in China, and more varieties are found there than elsewhere. It is cultivated for fiber in nearly all parts of the Chinese Republic, except in the extreme south, and over a wide range of differences in soil and climate with little interchange of seed, thus favoring the development and perpetuation of varietal differences.

The variety called "ta-ma" (great hemp) is cultivated chiefly in the provinces of Chekiang, Kiangsu, and Fukien, south of the Yangtze. In the rich lowland soils, often in rotation with rice, but not irrigated, and with a warmer and longer growing season than in Kentucky, this hemp attains a height of 10 to 15 feet. The seed is dark colored, usually well mottled, small, weighing about 1.2 grams per hundred. The internodes of the main stem are 6 to 10 inches long; the branches long and slender, usually drooping at the ends; the leaves large; and the pistillate flowers in small clusters.

Fig. 18.—Map of the world, showing the location of hemp cultivation for fiber, oil, and drug, with the sources and dates of introduction.

Seed brought from China to Kentucky in recent years is mostly of this variety. When first introduced it is too long in maturing to permit all of the seeds to ripen.

The most important fiber plant of western China is the variety of hemp called "hoa-ma." It is grown in the province of Szechwan and as a winter crop on the plains of Chengtu in that province. It is shorter and more compact in its habit of growth and earlier in maturing than the ta-ma of the lowlands.

A variety called "shan-ma-tse" is cultivated in the mountain valleys in the provinces of Shansi and Chihli, in northern China. Its fiber is regarded as the best in North China, and in some respects as superior to that of ta-ma, though the yield is usually smaller. The plants attain a height of 6 to 9 feet, with a very thin woody shell, short ascending branches, rather small leaves, and larger seeds in larger clusters than those of ta-ma. Imported seed of this variety, grown in a trial plat in Kentucky, produced plants smaller in size and maturing earlier than Kentucky hemp.

In the mountains both north and south of Ichang in central China a variety called "t'ang-ma" (cold hemp) is cultivated primarily for the production of seeds, from which oil is expressed. It is a very robust form, with stalks 6 to 12 feet high and 2 to 4 inches in diameter. These stalks are used for fuel, and occasionally a little fiber is stripped off for domestic use.

In Manchuria two distinct kinds of hemp are cultivated. One, called "hsien-ma," very similar to the shan-ma-tse of northern China, is grown for fiber. It attains a height of 8 to 9 feet, and requires nearly 150 days from seeding to full maturity. The other, called "shem-ma," is grown for oil-seed production. It attains a height of 3 to 5 feet and is ripe with fully matured seeds in less than 100 days. The branches usually remain undeveloped, so that the clusters of seeds are borne in compact heads at the tops of the simple stalks. (Pl. XLII, fig. 1.) It is said that in Manchuria these two forms remain distinct without crossing or producing any intergrading forms.

The Chinese name "ma" (fig. 17), originally applied only to the true hemp (*Cannabis sativa*), is now used as a

general term to designate nearly all textile plants in China.[1] This general use leads to nearly as much confusion among English-speaking people in China as does the unfortunate use of the name hemp as a synonym for fiber in this country. The staminate hemp plant is called "si-ma," and the pistillate plant "tsu-ma." Flax, cultivated to a limited extent in northern China, is called "siao-ma" (small hemp), but this name is also applied to small plants of true hemp. Ramie, cultivated in central and southern China, is "ch'u-ma" or "tsu-ma." China jute, cultivated in central and northern China and in Manchuria and Chosen (Korea), is called "tsing-ma," or "ching-ma," and its fiber, exported from Tientsin, is called "pei-ma." India jute, cultivated in southern China and Taiwan, is called "oi-ma." The name "chih-ma" is also applied in China to sesame, which is not a fiber plant.

JAPAN.

Hemp, called "asa" in the Japanese language, is cultivated chiefly in the provinces or districts of Hiroshima, Tochigi, Shimane, Iwate, and Aidzu, and to a less extent in Hokushu (Hokkaido) in the north and Kiushu in the south. It is cultivated chiefly in the mountain valleys, or in the north on the interior plains, where it is too cool for cotton and rice and where it is drier than on the coastal plain. That grown in Hiroshima, in the south, is tall, with a rather coarse fiber; that in Tochigi, the principal hemp-producing province, is shorter, 5 to 7 feet high, with the best and finest fiber, and in Hokushu it is still shorter.

Seeds from Hiroshima, Shimane, Aidzu, Tochigi, and Iwate were tried by the United States Department of Agriculture in 1901 and 1902. The plants showed no marked varietal differences. They were all smaller than the best Kentucky hemp. The seeds varied from light grayish brown, 5 millimeters ($\frac{1}{5}$ inch) long, to dark gray, 4 millimeters ($\frac{1}{6}$ inch) long. The largest plants in every trial plat were from Hiroshima seeds, and these seeds were larger and lighter colored than those of any other variety except Shimane, the seeds of which were slightly larger and the plants slightly smaller.

[1] Bretschneider, E. Botanicum Sinicum, p. 203, 1893.

RUSSIA.

Hemp is cultivated throughout the greater part of Russia, and it is one of the principal crops in the provinces of Orel, Kursk, Samara, Smolensk, Tula, Voronezh, and Poland. Two distinct types, similar to the tall fiber hemp and the short oil-seed hemp of Manchuria, are cultivated, and there are doubtless many local varieties in isolated districts where there is little interchange of seed. The crop is rather crudely cultivated, with no attempt at seed selection or improvement, and the plants are generally shorter and coarser than the hemp grown in Kentucky. The short oil-seed hemp with slender stems, about 30 inches high, bearing compact clusters of seeds and maturing in 60 to 90 days, is of little value for fiber production, but the experimental plats, grown from seed imported from Russia, indicate that it may be valuable as an oil-seed crop to be harvested and thrashed in the same manner as oil-seed flax.

HUNGARY.

The hemp in Hungary has received more attention in recent years than that in Russia, and this has resulted in a better type of plants. An experimental plat grown at Washington from Hungarian seed attained a height of 6 to 10 feet in the seed row. The internodes were rather short, the branches numerous, curved upward, and bearing crowded seed clusters and small leaves. About one-third of the plants had dark-purple or copper-colored foliage and were more compact in habit than those with normal green foliage.

ITALY.

The highest-priced hemp fiber in the markets of either America or Europe is produced in Italy,[1] but it is obtained from plants similar to those in Kentucky. The higher price of the fiber is due not to superior plants, but to water retting and to increased care and labor in the preparation of the fiber.

Four varieties are cultivated in Italy:

(1) "Bologna," or great hemp, called in France "chanvre de Piedmont," is grown in northern Italy in the provinces of Bologna, Ferrara, Roviga,

[1] Bruck, Werner F. Studien über den Hanfbau in Italien, p. 7, 1911.

and Modena. In the rich alluvial soils and under the intensive cultivation there practiced this variety averages nearly 12 feet in height, but it is said to deteriorate rapidly when cultivated elsewhere.

(2) "Cannapa picola," small hemp, attaining a height of 4 to 7 feet, with a rather slender reddish stalk, is cultivated in the valley of the Arno in the department of Tuscany.[1]

(3) "Neapolitan," large seeded.

(4) "Neapolitan," small seeded.

The two varieties of Neapolitan hemp are cultivated in the vicinity of Naples, and even so far up on the sides of Vesuvius that fields of hemp are occasionally destroyed by the eruptions of that volcano.

Seed of each of these Italian varieties has been grown in trial plats at Washington, D. C., and Lexington, Ky. The Bologna, or Piedmont, hemp in seed rows attained a height of 8 to 11 feet, nearly as tall as Kentucky seed hemp grown for comparison, but with thicker stalks, shorter and more rigid branches, and smaller and more densely clustered leaves. The small hemp, cannapa picola, was only 4 to 6 feet high. The large-seeded Neapolitan was 7 to 10 feet high, smaller than the Bologna, but otherwise more like Kentucky hemp, with more slender stalks and more open foliage. The small-seeded Neapolitan, with seeds weighing less than 1 gram per 100, rarely exceeded 4 feet in height in the series of plats where all were tried.

FRANCE.

Hemp is cultivated in France chiefly in the departments of Sarthe and Ille-et-Vilaine, in the valley of the Loire River. Two varieties are grown, the Piedmont, from Italian seed, and the common hemp of Europe. The former grows large and coarse, though not as tall as in the Bologna region, and it produces a rather coarse fiber suitable for coarse twines. The latter, seed of which is sown at the rate of 1½ to 2 bushels per acre, has a very slender stalk, rarely more than 4 or 5 feet high, producing a fine flaxlike fiber that is largely used in woven hemp linens.

The common hemp of Europe, which includes the short hemp of France, is also cultivated to a limited extent in Spain, Belgium, and Germany. It grows taller and coarser when sown less thickly on rich land, but it never attains the size of the Bologna type.

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[1] Dodge, Charles Richards. Culture of hemp in Europe. U. S. Department of Agriculture, Fiber Investigations, Report No. 11, p. 6, 1898.

CHILE.

Chilean hemp, originally from seed of the common hemp of Europe, has developed in three and a half centuries into coarser plants with larger seeds. When sown broadcast for fiber in Chile the plants attain a height of 6 to 8 feet, and when in checks or drills for seed they reach 10 to 12 feet.

Hemp from Chilean seed (S. P. I. No. 24307), grown at the experiment stations at Lexington, Ky., and St. Paul, Minn., in 1909, was 4 to 9 feet high in the broadcast plats and about the same height in the seed drills. It matured earlier than hemp of Chinese origin. Its leaves were small and crowded, with the seed clusters near the ends of slender, spreading branches. The fiber was coarse and harsh. The seeds were very large, 5 to 6 millimeters long, and weighed about 2 grams per 100.

TURKEY.

A variety of hemp, intermediate between the fiber-producing and the typical drug-producing types, is cultivated in Asiatic Turkey, especially in the region of Damascus, and to a limited extent in European Turkey. This variety, called Smyrna, is about the poorest variety from which fiber is obtained. It is cultivated chiefly for the narcotic drug, but fiber is also obtained from the stalks. It grows 3 to 6 feet high, with short internodes, numerous ascending branches, densely crowded foliage of small leaves, and abundant seeds maturing early. It seems well suited for the production of birdseed, but its poor type, combined with prolific seed production, makes it a dangerous plant to grow in connection with fiber crops.

INDIA.

Hemp is cultivated in India over an area of 2,000 to 5,000 acres annually for the production of the narcotic drugs known as hashish, charras, bhang, and ganja. Some fiber is obtained, especially from the staminate plants, in the northern part of Kashmir, where the hemp grown for the production of charras is more like the fiber types than that grown for bhang farther south.

Plants grown by the Department of Agriculture at Washington from seed received from the Botanical Garden at Sibpur, Calcutta, India, agreed almost perfectly with the de-

scription of *Cannabis indica* [1] written by Lamarck more than a century ago. (Pl. XLII, fig. 2.) They were distinctly different in general appearance from any of the numerous forms grown by this department from seed obtained in nearly all countries where hemp is cultivated, but the differences in botanical characters were less marked. The Indian hemp differed from Kentucky hemp in its more densely branching habit, its very dense foliage, the leaves mostly alternate, 7 to 11 (usually 9) very narrow leaflets, and in its nearly solid stalk. It was imperfectly diœcious, a character not observed in any other variety. Its foliage remained green until after the last leaves of even the pistillate plants of Kentucky hemp had withered and fallen. It was very attractive as an ornamental plant but of no value for fiber.

ARABIA AND AFRICA.

Hemp somewhat similar to that of India, but generally shorter, is cultivated in Arabia, northern Africa, and also by some of the natives in central and southern Africa for the production of the drug, but not for fiber. In Arabia it is called "takrousi," in Morocco "kief" or "kif," and in South Africa "dakkan." None of these plants is suitable for fiber production.

KENTUCKY.

Practically all of the hemp grown in the United States is from seed produced in Kentucky. The first hemp grown in Kentucky was of European origin, the seed having been brought to the colonies, especially Virginia, and taken from there to Kentucky. In recent years there has been practically no importation of seed from Europe. Remnants of the European types are occasionally found in the shorter, more densely branching stalks terminating in thick clusters of small leaves. These plants yield more seed and mature earlier than the more desirable fiber types introduced from China

Nearly all of the hemp now grown in Kentucky is of Chinese origin. Small packets of seed are received from American missionaries in China. These seeds are carefully cultivated for two or three generations in order to secure a sufficient quantity for field cultivation, and also to acclimate the plants to Kentucky conditions. Attempts to produce

[1] Lamarck. Encyclopedie, v. 1, p. 695, 1788.

fiber plants by sowing imported seed broadcast have not given satisfactory results. Seed of the second or third generation from China is generally regarded as most desirable. This Kentucky hemp of Chinese origin has long internodes, long, slender branches, opposite and nearly horizontal except the upper ones, large leaves usually drooping and not crowded, with the seeds in small clusters near the ends of the branches. Small, dark-colored seeds distinctly mottled are preferred by the Kentucky hemp growers. Under favorable conditions Kentucky hemp attains a height of 7 to 10 feet when grown broadcast for fiber and 9 to 14 feet when cultivated for seed.

IMPROVEMENT BY SEED INTRODUCTION.

Without selection or continued efforts to maintain superior types, the hemp in Kentucky deteriorates. As stated by the growers, the hemp "runs out." The poorer types of plants for fiber are usually the most prolific seed bearers, and they are often earlier in maturing; therefore, without selection or roguing, the seed of these undesirable types increases more rapidly than that of the tall, late-maturing, better types which bear fewer seeds. New supplies of seed are brought from China to renew the stock. Owing to the confusion of names the seed received is not always of a desirable kind, and sometimes jute, China jute, or ramie seeds are obtained. When seed of the ta-ma variety is secured and is properly cultivated for two or three generations there is a marked improvement, but these improved strains run out in less than 10 years.

The numerous trials that have been made by the Department of Agriculture with hemp seed from nearly all of the sources mentioned and repeated introductions from the more promising sources indicate that little permanent improvement may be expected from mere introduction not followed by breeding and continued selection. In no instance, so far as observed, have any of the plants from imported seed grown as well the first year as the Kentucky hemp cultivated for comparison. Further introduction of seed in small quantities is needed to furnish stock for breeding and selection. The most promising varieties for introduction are ta-ma and shan-ma-tze, from China; Hiroshima and Tochigi, from Japan; Bologna, from Italy; and improved types from Hungary.

IMPROVEMENT BY SELECTION.

Kentucky hemp is reasonably uniform, not because of selection, or even grading the seeds, but because all types have become mixed together. Nearly all the seed is raised in a limited area. Hemp being cross-fertilized, it is more difficult to keep distinct types separate than in the case of wheat, flax, or other crops with self-pollinated flowers, but it is merely necessary to isolate the plants cultivated for seed and then exercise care to prevent the seed from becoming mixed. Until 1903 no well-planned and continued effort seems to have been undertaken in this country to produce an improved variety of hemp. At that time the results of breeding by careful selection improved varieties of wheat and flax at the Minnesota Agricultural Experiment Station were beginning to yield practical returns to the farmers of that State. Mr. Fritz Knorr, from Kentucky, then a student in the Minnesota College of Agriculture, was encouraged to take up the work with hemp. Seed purchased from a dealer in Nicholasville, Ky., was furnished by the United States Department of Agriculture. The work of selection was continued until 1909 under the direction of Prof. C. P. Bull, agronomist at the station. Points especially noted in selecting plants from which to save seed for propagation were length of internode, thinness of shell, height, and tendency of the stems to be well fluted. The seasons there were too short to permit selection for plants taking a longer season for growth. The improved strain of hemp thus developed was called Minnesota No. 8. Seed of this strain sown at the experiment station at Lexington, Ky., in 1910 and 1911 produced plants more uniform than those from unselected Kentucky seed, and the fiber was superior in both yield and quality. A small supply of this seed, grown by the Department of Agriculture at Washington, D. C., in 1912, was distributed to Kentucky hemp-seed growers in 1913, and in every instance the resulting seed plants were decidedly superior to those from ordinary Kentucky seed.

Seed selection is practiced to a limited extent on some of the best hemp-seed farms in Kentucky. Before the seed-hemp plants are cut the grower goes through the field and marks the plants from which seed is to be saved for the seed crop of the following year. Plants are usually selected for height, lateness, and length of internodes. Continued selec-

HEMP, PLANT AND FIBER.

Pistillate plant, left; staminate plant, right. Fig. 2.—Staminate flowers. Fig. 3.—Pistillate flowers. Fig. 4.—Fiber in the form in which it leaves the farm.

DETAILS OF HEMP PLANT.

Fig. 1.—Leaf, one-third natural size. Fig. 2.—Seeds, natural size. Fig. 3.—Roots, showing strong taproot. Fig. 4.—Sections of stalk, showing woody shell slightly thickened at the nodes.

DIFFERENT TYPES OF HEMP AND SEED HEMP.

Fig. 1.—Manchurian oil-seed hemp. Fig. 2.—India drug-producing hemp on left; Kentucky fiber-producing hemp in seed rows on right. Fig. 3.—Hemp-seed field in Kentucky River Valley, walled in with ledges of lime rock.

SEED HEMP AND MALADIES.

Fig. 1.—Shock of seed hemp curing. Fig. 2.—Seed-hemp plant attacked by fungus disease. Fig. 3.—Branched broom rape, parasitic on hemp roots.

tion in this manner will improve the type. Without selection continued each season, the general average of the crop deteriorates.

CLIMATE.

Hemp requires a humid temperate climate, such as that throughout the greater part of the Mississippi Valley. It has been grown experimentally as far north as Saskatoon, in northwestern Canada, and as far south as New Orleans, La., and Brunswick, Ga.

TEMPERATURE.

The best fiber-producing types of hemp require about four months free from killing frosts for the production of fiber and about five and one-half months for the full maturity of the seeds. The climatic conditions during the four months of the hemp-growing season in the region about Lexington, Ky., are indicated by the following table:

Temperature and rainfall in the hemp-growing region of Kentucky.[1]

Month.	Temperature.			Precipitation.		
	Mean.	Absolute maximum.	Absolute minimum.	Mean.	Total amount driest year.	Total amount wettest year.
	°F.	*°F.*	*°F.*	*Inches.*	*Inches.*	*Inches.*
May	64	91	32	3.6	2.7	4.7
June	73	95	42	4.2	3.7	7.4
July	76	102	51	4.0	2.6	3.1
August	75	96	51	3.8	3.7	7.3
Mean for 4 months	72	....	....	3.9	....	....
Annual mean	55	....	....	42.5	....	....

[1] Henry, Alfred Judson. Climatology of the United States. U. S. Department of Agriculture, Weather Bureau, Bulletin Q, p. 762, 1906.

Hemp grows best where the temperature ranges between 60° and 80° F., but it will endure colder and warmer temperatures. Young seedlings and also mature plants will endure with little injury light frosts of short duration. Young hemp is less susceptible than oats to injury from frost, and fields of hemp ready for harvest have been uninjured by frosts which ruined fields of corn all around them. Frosts are injurious to nearly mature plants cultivated for seed production.

RAINFALL.

Hemp requires a plentiful supply of moisture throughout its growing season, and especially during the first six weeks. After it has become well rooted and the stalks are 20 to 30 inches high it will endure drier conditions, but a severe drought hastens its maturity and tends to dwarf its growth. It will endure heavy rains, or even a flood of short duration, on light, well-drained soils, but on heavy, impervious soils excessive rain, especially when the plants are young, will ruin the crop.

In 1903, a large field of hemp on rich, sandy-loam soil of alluvial deposit, well supplied with humus, near Gridley, Cal., was flooded to a depth of 2 to 6 inches by high water in the Feather River. The hemp had germinated but a few days before and was only 1 to 3 inches high. The water remained on the land about three days. The hemp started slowly after the water receded, but in spite of the fact that there was no rain from this time, the last of March, until harvest, the last of August, it made a very satisfactory crop, 6 to 12 feet in height. The soil, of porous, spongy texture, remained moist below the dusty surface during the entire growing season.

An experimental crop of about 15 acres on impervious clay and silt of alluvial deposit, but lacking in humus, in eastern Louisiana was completely ruined by a heavy rain while the plants were small.

The total average rainfall during the four months of the hemp-growing season in Kentucky is 15.6 inches, as shown in the table on page 305, and this is distributed throughout the season. When there is an unusual drought in that region, as in 1913, the hemp is severely injured. It is not likely to succeed on upland soils in localities where corn leaves curl because of drought before the middle of August.

IRRIGATION.

In 1912, and again in 1913, crops of hemp were cultivated under irrigation at Lerdo, Cal. The soil there is an alluvial sandy loam of rather firm texture, but with good natural drainage and not enough clay to form a crust on the surface after flooding with water. The land is plowed deeply, leveled, and made up into irrigation blocks with low borders over which drills and harvesting machinery may easily work.

The seed is drilled in the direction of the fall, so that when flooded the water runs slowly down the drill furrows. Three irrigations are sufficient, provided the seed is sown early enough to get the benefit of the March rains. The fiber thus produced is strong and of good quality.

WEATHER FOR RETTING AND BREAKING.

Cool, moist weather, light snows, or alternate freezing and thawing are favorable for retting hemp. Dry weather, not necessarily free from rain but with a rather low relative humidity, is essential for satisfactory work in breaking hemp. The relative humidity at Lexington in January, February, and March, when most of the hemp is broken, ranges from 62 to 82 per cent. The work of breaking hemp is rarely carried on when there is snow on the ground. The work of collecting and cleaning hemp seed can be done only in dry weather.

SOIL.

SOILS IN THE HEMP-GROWING REGION OF KENTUCKY.

The soil in most of the hemp fields of Kentucky is of a yellowish clay loam, often very dark as a result of decaying vegetable matter, and most of it overlying either Lexington or Cincinnati limestone. There are frequent outcroppings of lime rock throughout the region. The soil is deep, fertile, well supplied with humus, and its mechanical condition is such that it does not quickly dry out or become baked and hard. The land is rolling, affording good natural drainage.

HEMP SOILS IN OTHER STATES.

In eastern Nebraska, hemp has been grown on a deep clay-loam prairie soil underlain with lime rock. In some of the fields there are small areas of gumbo soil, but hemp does not grow well on these areas. In California, hemp is cultivated on the reclaimed lands of alluvial deposits in the lower valley of the Sacramento River. This is a deep soil made up of silt and sand and with a very large proportion of decaying vegetable matter. These rich, alluvial soils, which are never subject to drought, produce a heavier growth of hemp than the more shallow upland soils in Kentucky. In Indiana, crops of hemp have been grown in the Kankakee Valley on peaty soils overlying marl or yellow clay containing an abundance of lime. These lands have

been drained by large, open ditches. There is such a large proportion of peat in the soil that it will burn for months if set on fire during the dry season, yet this soil contains so much lime that when the vegetation is cleared away Kentucky bluegrass comes in rather than sedges. It is an alkaline rather than an acid soil. The large amount of peat gives these soils a loose, spongy texture, well adapted to hold moisture during dry seasons. Water remains in the ditches 6 to 10 feet below the surface nearly all summer, and the hemp crops have not been affected by the severe drought which has injured other crops on the surrounding uplands. In southeastern Pennsylvania, and in Indiana, Wisconsin, and Minnesota, the best crops, producing the largest yields of fiber and fiber of the best quality, have been grown on clay-loam upland soils. In some instances, however, the upland crops have suffered from drought.

SOILS SUITED TO HEMP.

Hemp requires for the best development of the plant, and also for the production of a large quantity and good quality of fiber, a rich, moist soil having good natural drainage, yet not subject to severe drought at any time during the growing season. A clay loam of rather loose texture and containing a plentiful supply of decaying vegetable matter or an alluvial deposit alkaline and not acid in reaction should be chosen for this crop.

SOILS TO BE AVOIDED.

Hemp will not grow well on stiff, impervious, clay soils, or on light sandy or gravelly soils. It will not grow well on soils that in their wild state are overgrown with either sedges or huckleberry bushes. These plants usually indicate acid soils. It will make only a poor growth on soils with a hardpan near the surface or in fields worn out by long cultivation. Clay loams or heavier soils give heavier yields of strong but coarser fiber than are obtained on sandy loams and lighter soils.

EFFECT OF HEMP ON THE LAND.

Hemp cultivated for the production of fiber, cut before the seeds are formed and retted on the land where it has been grown, tends to improve rather than injure the soil. It improves its physical condition, destroys weeds, and does not exhaust its fertility.

PHYSICAL CONDITION.

Hemp loosens the soil and makes it more mellow. The soil is shaded by hemp more than by any other crop. The foliage at the top of the growing plants makes a dense shade and, in addition, all of the leaves below the top fall off, forming a mulch on the ground, so that the surface of the soil remains moist and in better condition for the action of soil bacteria. The rather coarse taproots (Pl. XLI, fig. 3), penetrating deeply and bringing up plant food from the subsoil, decay quickly after the crop is harvested and tend to loosen the soil more than do the fibrous roots of wheat, oats, and similar broadcast crops. Land is more easily plowed after hemp than after corn or small grain.

HEMP DESTROYS WEEDS.

Very few of the common weeds troublesome on the farm can survive the dense shade of a good crop of hemp. If the hemp makes a short, weak growth, owing to unsuitable soil, drought, or other causes, it will have little effect in checking the growth of weeds, but a good, dense crop, 6 feet or more in height, will leave the ground practically free from weeds at harvest time. In Wisconsin, Canada thistle has been completely killed and quack-grass severely checked by one crop of hemp. In one 4-acre field in Vernon County, Wis., where Canada thistles were very thick, fully 95 per cent of the thistles were killed where the hemp attained a height of 5 feet or more, but on a dry, gravelly hillside in this same field where it grew only 2 to 3 feet high, the thistles were checked no more than they would have been in a grain crop. Some vines, like the wild morning-glory and bindweed climb up the hemp stalks and secure light enough for growth, but low-growing weeds can not live in a hemp field.

HEMP DOES NOT EXHAUST THE FERTILITY OF THE SOIL.

An abundant supply of plant food is required by hemp, but most of it is merely borrowed during development and returned to the soil at the close of the season. The amounts of the principal fertilizing elements contained in mature crops of hemp, as compared with other crops, are shown in the accompanying table.

Amounts of principal fertilizing elements in an acre of hemp, corn, wheat, oats, sugar beets, and cotton.

Crops.	Nitrogen.	Phosphoric acid.	Potassium.
	Pounds.	*Pounds.*	*Pounds.*
Hemp (yielding 1,000 pounds of clean fiber)[1]	62.7	33.2	101.3
Corn (50 bushels and 1½ tons of stover)[2]	74.0	11.5	35.5
Wheat (25 bushels of grain, 1½ tons of straw)[2]	48.0	8.0	24.0
Oats (50 bushels of grain, 1½ tons of straw)[2]	48.5	8.0	34.0
Sugar beets (20 tons of roots)[2]	100.0	18.0	157.0
Cotton (yielding 400 pounds of lint)[1]	29.2	22.5	35.3

[1] Jaffa, M. E. Composition of the Ramie Plant. California Experiment Station Bulletin, p. 94, 1891.

[2] Hopkins, Cyril G., and Pettit, James H. The Fertility in Illinois Soils. Illinois Experiment Station Bulletin 123, p. 189, 1908.

The data in the table indicate that hemp requires for its best development a richer soil than any of the other crops mentioned except sugar beets. These other crops, except the stalks of corn and the tops of beets, are entirely removed from the land, thus taking away nearly all the plant food consumed in their growth. Only the fiber of hemp is taken away from the farm and this is mostly cellulose, composed of water and carbonic acid.

The relative proportions by weight of the different parts of the hemp plant, thoroughly air dried, are approximately as follows: Roots 10 per cent, stems 60 per cent, and leaves 30 per cent.[1] The mineral ingredients of these different parts of the hemp plant are shown in the following table:

Ash ingredients of the leaves, stalks, and roots of the hemp plant, carbonic acid excluded, 100 parts dried material in each case.[1]

Ingredients.	Leaves.	Stalks.	Roots.
Lime	4.992	0.949	0.713
Magnesia	.585	.194	.291
Potash	2.858	1.659	1.829
Soda	.024		
Phosphoric acid	.947	.447	.531
Sulphuric acid	.226	.040	.047
Chlorin	.017	.019	.014
Silica	.575	.035	.077
Percentage of ash	10.224	3.343	3.502

[1] Peter, Robert. Chemical Examination of the Ash of Hemp and Buckwheat Plants. Kentucky Geological Survey, p. 12, 1884.

The foliage, constituting nearly one-third of the weight of the entire plant and much richer in essential fertilizing elements than the stalks, all returns to the field where the hemp grows. The roots also remain and, together with the stubble, they constitute more than 10 per cent of the total weight and contain approximately the same proportions of fertilizing elements as the stalks. The leaves and roots therefore return to the soil nearly two-thirds of the fertilizing elements used in building up the plant.

After the hemp is harvested it is spread out on the same land for retting. In this retting process nearly all of the soluble ingredients are washed out and returned to the soil. When broken in the field on small hand brakes, as is still the common practice in Kentucky, the hurds, or central woody portion of the stalk, together with most of the outer bark, are left in small piles and burned, returning the mineral ingredients to the soil. Where machine brakes are used the hurds may serve an excellent purpose as an absorbent in stock yards and pig pens, to be returned to the fields in barnyard manure.

The mineral ingredients permanently removed from the farm are thus reduced to the small proportions contained in the fiber. These proportions, calculated in pounds per acre and compared with the amounts removed by other crops, are shown in the following table:

Mineral ingredients removed from the soil by hemp, wheat, corn, and tobacco, calculated in pounds per acre.[1]

Ingredients.	Hemp fiber: In 800 pounds.	Wheat: In 20 bushels.	Corn: In 50 bushels.	Tobacco, including stalks: In 1,000 pounds.
Lime	7.872	1.63	0.22	68.00
Magnesia	1.128	2.43	3.61	8.67
Potash	.968	5.45	8.06	69.73
Soda	.096	.13	6.22	6.80
Phosphoric acid	2.080	9.12	11.85	8.13
Sulphuric acid	.232	.08	(2)	8.40
Chlorin	.016	.35	(2)	1.06
Silica	.736	.41	.71	5.86
Total ash	13.128	19.60	30.67	176.65

[1] Peter, Robert. Chemical Examination of the Ash of Hemp and Buckwheat Plants. Kentucky Geological Survey, p. 17, 1884.

[2] Not estimated.

The hemp fiber analyzed was in the ordinary condition as it leaves the farm. When washed with cold water, removing some but not all of the dirt, the ashy residue was reduced more than one-third, and the total earthy phosphates were reduced nearly one-half. The amount of plant food actually removed from the soil by hemp is so small as to demand little attention in considering soil exhaustion. The depletion of the humus is the most important factor, but even in this respect hemp is easier on the land than other crops except clover and alfalfa. The fact that hemp is often grown year after year on the same land for 10 to 20 years, with little or no application of fertilizer and very little diminution in yield, is evidence that it does not exhaust the soil.

ROTATION OF CROPS.

In Kentucky, hemp is commonly grown year after year on the same land without rotation. It is the common practice in that State to sow hemp after bluegrass on land that has been in pasture for many years, or sometimes it is sown as the first crop on recently cleared timberland. It is then sown year after year until it ceases to be profitable or until conditions favor the introduction of other crops. On the prairie soils in eastern Nebraska and also on the peaty soils in northern Indiana, more uniform crops were obtained after the first year. On some of the farms in California hemp is grown in rotation with beans. Hemp is recommended to be grown in rotation with other farm crops on ordinary upland soils suited to its growth. In ordinary crop rotations it would take about the same place as oats. If retted on the same land, however, it would occupy the field during the entire growing season, so that it would be impossible to sow a field crop after hemp unless it were a crop of rye. The growing of rye after hemp has been recommended in order to prevent washing and to retain the soluble fertilizing elements that might otherwise be leached out during the winter. This recommendation, however, has not been put in practice sufficiently to demonstrate that it is of any real value. Hemp will grow well in a fertile soil after any crop, and it leaves the land in good condition for any succeeding crop. Hemp requires a plentiful supply of fertilizing elements, especially nitrogen, and it is therefore best

to have it succeed clover, peas, or grass sod. If it follows wheat, oats, or corn, these crops should be well fertilized with barnyard manure. The following crop rotations are suggested for hemp on fertile upland soils:

First year.	Second year.	Third year.	Fourth year.	Fifth year.
Hemp	Corn	Wheat	Clover	Grass and pasture.
Do	Sugar beets, potatoes, or onions.	...do	.....do	Do.
Corn	Peas or beans	Hemp	Barley or oats	Clover.

Hemp leaves the ground mellow and free from weeds and is therefore recommended to precede sugar beets, onions, celery, and similar crops which require hand weeding. If hemp is grown primarily to kill Canada thistle, quack-grass, or similar perennial weeds, it may be grown repeatedly on the same land until the weeds are subdued.

FERTILIZERS.

Hemp requires an abundant supply of plant food. Attaining in four months a height of 6 to 12 feet and producing a larger amount of dry vegetable matter than any other crop in temperate climates, it must be grown on a soil naturally fertile or enriched by a liberal application of fertilizer. In Europe and in Asia heavy applications of fertilizers are used to keep the soils up to the standard for growing hemp, but in the United States most of the hemp is grown on lands the fertility of which has not been exhausted by centuries of cultivation. In Kentucky, where the farms are well stocked with horses and cattle, barnyard manure is used to maintain the fertility of the soils, but it is usually applied to other crops and not directly to hemp. In other States no fertilizer has been applied to soils where hemp is grown, except in somewhat limited experiments.

Barnyard manure.—The best single fertilizer for hemp is undoubtedly barnyard manure. It supplies the three important plant foods, nitrogen, potash, and phosphoric acid, and it also adds to the store of humus, which appears to be more necessary for hemp than for most other farm crops. If other fertilizers are used, it is well to apply barnyard manure also, but it should be applied to the preceding crop,

or, at the latest, in the fall before the hemp is sown. It must be well rotted and thoroughly mixed with the soil before the hemp seed is sown, so as to promote a uniform growth of the hemp stalks. Uniformity in the size of the plants of other crops is of little consequence, but in hemp it is a matter of prime importance. An application of coarse manure in the spring, just before sowing, is likely to result in more injury than benefit. The amount that may be applied profitably will vary with different soils. There is little danger, however, of inducing too rank a growth of hemp on upland soils, provided the plants are uniform, for it must be borne in mind that stalk and not fruit is desired. On soils deficient in humus as the result of long cultivation, the increased growth of hemp may well repay for the application of 15 to 20 tons of barnyard manure per acre. It would be unwise to sow hemp on such soils until they had been heavily fertilized with barnyard manure.

COMMERCIAL FERTILIZERS.—On worn-out soils, peaty soils, and possibly on some alluvial soils, commercial fertilizers may be used with profit in addition to barnyard manure. The primary effect to be desired from commercial fertilizers on hemp is a more rapid growth of the crop early in the season. This rapid early growth usually results in a greater yield and better quality of fiber. The results of a series of experiments conducted at the agricultural experiment station at Lexington, Ky., in 1889 led to the following conclusions:[1]

(1) That hemp can be raised successfully on worn bluegrass soils with the aid of commercial fertilizers.

(2) That both potash and nitrogen are required to produce the best results.

(3) That the effect was the same, whether muriate or sulphate was used to furnish potash.

(4) That the effect was about the same, whether nitrate of soda or sulphate of ammonia was used to furnish nitrogen.

(5) That a commercial fertilizer containing about 6 per cent of available phosphoric acid, 12 per cent of actual potash, and 4 per cent of nitrogen (mostly in the form of nitrate of soda or sulphate of ammonia) would be a good fertilizer for trial.

The increased yield and improved quality of the fiber on the fertilized plats compared with the yield from the check plat, not fertilized, in these experiments would warrant the

[1] Scovel, M. A. Effect of Commercial Fertilizers on Hemp. Kentucky Agricultural Experiment Station, Bulletin 27, p. 3, 1890.

application of nitrogen at the rate of 160 pounds of nitrate of soda or 120 pounds of sulphate of ammonia per acre, and potash at the rate of about 160 pounds of either sulphate or muriate of potash per acre.

On the rich alluvial soils reclaimed by dikes from the Sacramento River at Courtland, Cal., Mr. John Heaney has found that an application of nitrate of soda at the rate of not more than 100 pounds per acre soon after sowing and again two weeks to a month later, or after the first application has been washed down by rains, will increase the yield and improve the quality of the fiber.

LEGUMINOUS CROPS OR GREEN MANURE.—Beans grown before hemp and the vines returned to the land and plowed under have given good results in increased yield and improved quality of fiber on alluvial soils at Courtland, Cal. Clover is sometimes plowed under in Kentucky to enrich the land for hemp. It must be plowed under during the preceding fall, so as to become thoroughly rotted before the hemp is grown.

HEMP AS A GREEN MANURE.—In experiments with various crops for green manure for wheat in India, hemp was found to give the best results.[1] In exceptionally dry seasons, as in 1908 and 1913, many fields of hemp do not grow high enough to be utilized profitably for fiber production. They are often left until fully mature and then burned. Better results would doubtless be obtained if the hemp were plowed under as soon as it could be determined that it would not make a sufficient growth for fiber production. Mature hemp stalks or dry hurds should not be plowed under, because they rot very slowly

DISEASES, INSECTS, AND WEEDS.

Hemp is remarkably free from diseases caused by fungi. In one instance at Havelock, Nebr., in a low spot where water had stood, nearly 3 per cent of the hemp plants were dead. The roots of these dead plants were pink in color and a fungous mycelium was found in them, but it was not in a stage of development to permit identification. The fungus was probably not the primary cause of the trouble, since the dead plants were confined to the low place and

[1] Report of Cawnpore Agricultural Station, United Provinces, India, for 1908, p. 12.

there was no recurrence of the disease on hemp grown in the same field the following year.

A fungus described under the name *Dendrophoma marconii* Cav. was observed on hemp in northern Italy in 1887.[1] This fungus attacked the plants after they were mature enough to harvest for fiber. Its progress over the plant attacked and also the distribution of the infection over the field were described as very rapid, but if the disease is discovered at its inception and the crop promptly harvested it causes very little damage.

In the fall of 1913 a disease was observed on seed hemp grown by the Department of Agriculture at Washington. (Pl. XLIII, fig. 2.) It did not appear until after the stage of full flowering of the staminate plants and therefore after the stage for harvesting for fiber. A severe hailstorm had bruised the plants and broken the bark, doubtless making them more susceptible to the disease. The first symptoms noted in each plant attacked were wilted leaves near the ends of branches above the middle of the plant, accompanied by an area of discolored bark on the main stalk below the base of each diseased branch. In warm, moist weather the disease spread rapidly, killing a plant 10 feet high in five days and also infesting other plants. It was observed only on pistillate plants, but the last late-maturing staminate plants left in the plat after thinning the earlier ones were cut soon after the disease was discovered.[2]

In a few instances insects boring in the stems have killed some plants, but the injury caused in this manner is too small to be regarded as really troublesome.

Cutworms have caused some damage in the late-sown hemp in land plowed in the spring, but there is practically no danger from this source in hemp sown at the proper season and in fall-plowed land well harrowed before sowing.

A Chilean dodder (*Cuscuta racemosa*) troublesome on alfalfa in northern California was found on the hemp at Gridley, Cal., in 1903. Although it was abundant in some parts of the field at about the time the hemp was ready for harvest, it did not cause any serious injury.

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[1] Cavara, Fridiano. Appunti di Patologia Vegetal. Atti dell' Instituto Botanico dell' Università di Pavia, s. 2, v. 1, p. 425, 1888.

[2] This fungus was not in a stage permitting identification, but cultures for further study were made in the Laboratory of Plant Pathology.

Black bindweed (*Polygonum convolvulus*) and wild morning-glory (*Convolvulus sepium*) sometimes cause trouble in low, rich land by climbing up the plants and binding them together.

The only really serious enemy to hemp is branched broom rape (*Orobanche ramosa*). (Pl. XLIII, fig. 3.) This is a weed 6 to 15 inches high, with small, brownish yellow, scalelike leaves and rather dull purple flowers. The entire plant is covered with sticky glands which catch the dust and give it a dirty appearance. Its roots are parasitic on the roots of hemp. It is also parasitic on tobacco and tomato roots.[1] Branched broom rape is troublesome in Europe and the United States, but is not known in Asia. Its seeds are very small, about the size of tobacco seed, and they stick to the gummy calyx surrounding the hemp seed when the seed-hemp plants are permitted to fall on the ground in harvesting. There is still more opportunity for them to come in contact with the seed of hemp grown for fiber. The broom rape is doubtless distributed more by means of lint seed (seed from overripe fiber hemp) than by any other means. When broom rape becomes abundant it often kills a large proportion of the hemp plants before they reach maturity. As a precaution it is well to sow only well-cleaned seed from cultivated hemp and insist on a guaranty of no lint seed. If the land becomes infested, crops other than hemp, tobacco, tomatoes, or potatoes should be grown for a period of at least seven years. The seeds retain their vitality several years.[2]

HEMP-SEED PRODUCTION.

All of the hemp seed used in the United States for the production of hemp for fiber is produced in Kentucky. Nearly all of it is obtained from plants cultivated especially for seed production and not for fiber. The plants cultivated for seed for the fiber crop are of the fiber-producing type and not the type commonly obtained in bird-seed hemp. Old stocks of hemp seed of low vitality are often sold for bird seed, but much of the hemp seed sold by seedsmen or dealers in bird supplies is of the densely branching Smyrna type.

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[1] Garman, H. The Broom-Rape of Hemp and Tobacco. Kentucky Agricultural Experiment Station, Bulletin 24, p. 16, 1890.

[2] Garman, H. The Broom-Rapes. Kentucky Agricultural Experiment Station, Bulletin 105, p. 14, 1903.

LINT SEED.

In some instances seed is saved from hemp grown for fiber but permitted to get overripe before cutting. This is known as lint seed. It is generally regarded as inferior to seed from cultivated plants. A good crop is sometimes obtained from lint seed, but it is often lacking in vigor as well as germinative vitality, and it is rare that good crops are obtained from lint seed of the second or third generation.

CULTIVATED SEED.

Nearly all of the cultivated seed is grown in the valley of the Kentucky River and along the creeks tributary to this river for a distance of about 50 miles above High Bridge. The river through this region flows in a deep gorge about 150 feet below the general level of the land. The sides of this valley are steep, with limestone outcropping, and in some places perpendicular ledges of lime rock in level strata. (Pl. XLII, fig. 3.) The river, which overflows every spring, almost covering the valley between the rocky walls, forms alluvial deposits from a few rods to half a mile in width. The seed hemp is grown on these inundated areas, and especially along the creeks, where the water from the river backs up, leaving a richer deposit of silt than along the banks of the river proper, where the deposited soils are more sandy. There is a longer season free from frost in these deep valleys than on the adjacent highlands. Instead of having earlier frosts in the fall, as may be usually expected in lowlands, the valley is filled with fog on still nights, thus preventing damage from frost. For the production of hemp seed a rich, alluvial soil containing a plentiful supply of lime and also a plentiful supply of moisture throughout the growing season is necessary. The crop also requires a long season for development. The young seedlings will endure light frosts without injury, but a frost before harvest will nearly ruin the crop. A period of dry weather is necessary after the harvest in order to beat out and clean the seeds.

PREPARATION OF LAND.

The land is plowed as soon as possible after the spring floods, which usually occur in February and early in March.

After harrowing, it is marked in checks about 4 or 5 feet each way. Hemp cultivated for seed production must have room to develop branches. (Pl. XL, fig. 1.)

PLANTING.

The seed is planted between the 20th of March and the last of April—usually earlier than the seed is sown for the production of fiber. It is usually planted by hand, 5 to 7 seeds in a hill, and covered with a hoe. In some instances planters are used, somewhat like those used for planting corn, and on some farms seeders are used which plant 1 or 2 drills at a time 4 or 5 feet apart. When planted in drills it is usually necessary to thin out the plants afterwards. One or two quarts of seed are sufficient to plant an acre. Less than one quart would be sufficient if all the plants were allowed to grow.

CULTIVATION.

On the best farms the crop is cultivated four times—twice rather deep and twice with cultivators with fine teeth, merely stirring the surface. When the first flowers are produced, so that the staminate plants may be recognized, all of these plants are cut out except about one per square rod. These will produce sufficient pollen to fertilize the flowers on the pistillate, or seed-bearing plants, and the removal of the others will give more room for the development of the seed-bearing plants.

HARVEST.

The seed-bearing plants are allowed to remain until fully mature, or as long as possible without injury from frost. They are cut with corn knives, usually during the first half of October, leaving the stubble 10 to 20 inches high. The plants are set up in loose shocks around one or two plants which have been left standing. The shocks are usually bound near the top with binder twine. They are left in this manner for two or three weeks, until thoroughly dry. (Pl. XLIII, fig. 1.)

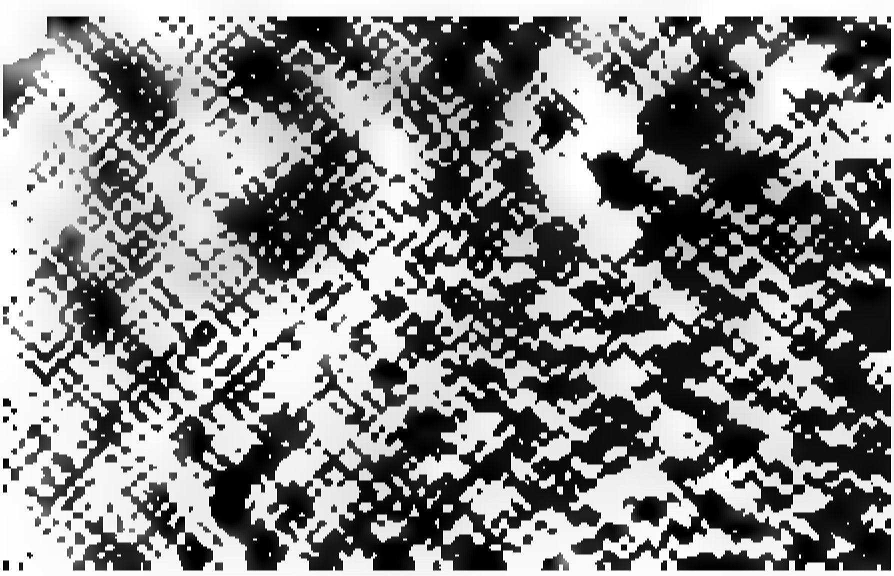
COLLECTING THE SEED.

When the seed hemp is thoroughly dry, men (usually in gangs of five or six, with tarpaulins about 20 feet square) go

into the field. One man with an ax cuts off the hemp stubble between four shocks and clears a space large enough to spread the tarpaulin. The other men pick up an entire shock and throw it on the tarpaulin. They then beat off the seeds with sticks about 5 feet long and 1½ inches in diameter. (Pl. XLIV, fig. 1.) When the seed has been beaten off from one side of the shock the men turn it over by means of the sticks, and after beating off all of the seed they pick up with the sticks the stalks in one bunch and throw them off the canvas, and then treat another shock in the same manner. They will beat off the seed from four shocks in 15 to 20 minutes, securing 2 or 3 pecks of seed from each shock. While this seems a rather crude way of collecting the seed, it is doubtless the most economical and practical method that may be devised. The seed falls so readily from the dry hemp stalks that it would be impossible to move them without a very great loss. Furthermore, it would be very difficult to handle plants 10 to 14 feet high, with rigid branches 3 to 6 feet in length, so as to feed them to any kind of thrashing machine.

CLEANING THE SEED.

The seed and chaff which have been beaten on the tarpaulin are sometimes beaten or tramped to break up the coarser bunches and stalks, and in some instances they are rubbed through coarse sieves in order to reduce them enough to be put through a fanning mill. The seed is then partly cleaned by a fanning mill in the field and afterwards run once or twice through another mill with finer sieves and better adjustments of fans. Even after this treatment it is usually put through a seed-cleaning machine by the dealers. There has recently been introduced on some of the best seed-hemp farms a kind of homemade thrashing machine, consisting essentially of a feeding device, cylinder, and concaves, attached to a rather large fanning mill, all being driven by a gasoline engine. (Pl. XLIV, fig. 2.) The hemp seed is fed to this machine just as it comes from the tarpaulin after beating off from the shock. It combines the process of breaking up the chaff into finer pieces and the work of fanning the seed in the field, and it performs this work more effectively and more rapidly.



COLLECTING SEED AND RETTING STALKS.

Fig. 1.—Beating off seed from an entire shock of seed hemp. Fig. 2.—Homemade hemp seed-cleaning machine. Fig. 3.—Spreading fiber hemp for retting.

CUTTING HEMP.

FIG. 1.—Cutting hemp by hand, about three-fourths acre per day. FIG. 2.—Self-rake reaper, mostly used, cuts about four acres per day. FIG. 3.—Mowing machine with bar to bend over hemp, cuts about six acres per day.

BREAKING HEMP.

Fig. 1.—The hand brake, cleans about 100 pounds of fiber per day. Fig. 2.—Shock of hemp, tied in bundles for stacking. Fig. 3.—Machine brake which has produced 9,000 pounds of fiber in one day. Fig. 4.—Machine brake which separates and cleans the tow and the line fiber at the same time.

YIELD.

Under favorable conditions the yield of hemp seed ranges from 12 to 25 bushels per acre. From 16 to 18 bushels are regarded as a fair average yield.

COST OF SEED PRODUCTION.

The hemp-seed growers state that it costs about $2.50 per bushel to produce hemp seed, counting the annual rental of the land at about $10 per acre. With the introduction of improved machinery for cleaning the hemp this cost may be somewhat reduced, since it is estimated that with the ordinary methods of rubbing the seed through sieves or beating it to reduce the chaff to finer pieces the cost from beating it off the shock to delivering it at the market is about 50 cents per bushel. These estimates of cost are based on wages at $1.25 per day.

PRICES.

The price of hemp seed, as sold by the farmer during the past 10 years, has ranged from $2.50 to $5 per bushel. The average farm price during this period has been not far from $3 per bushel. Hemp seed is sold by weight, a bushel weighing 44 pounds.

CULTIVATION FOR FIBER.

PREPARATION OF THE LAND.

Fall plowing on most soils is generally regarded as best for hemp, since the action of the frost in winter helps to disintegrate the particles of soil, making it more uniform in character. In practice, hemp land is plowed at any time from October to late seeding time in May, but hemp should never be sown on spring-plowed sod. The land should be plowed 8 or 9 inches in order to give a deep seed bed and opportunity for root development. Plowing either around the field or from the center is recommended, since back furrows and dead furrows will result in uneven moisture conditions and more uneven hemp. Before sowing, the land is harrowed to make a mellow seed bed and uniform level surface. Sometimes this harrowing is omitted, especially when hemp is grown on stubble ground plowed just before seeding. Harrowing or leveling in some manner is recom-

mended at all times, in order to secure conditions for covering the seed at a uniform depth and also to facilitate close cutting at harvest time.

SEEDING.

METHODS OF SEEDING.

Hemp seed should be sown as uniformly as possible all over the ground and covered as nearly as possible at a uniform depth of about three-fourths of an inch, or as deep as 2 inches in light soils. Ordinary grain drills usually plant the seed too deeply and in drills too far apart for the best results. Uniform distribution is sometimes secured by drilling in both directions. This double working, especially with a disk drill, leaves the land in good condition. Ordinary grain drills do not have a feed indicator for hemp seed, but they may be readily calibrated, and this should be done before running the risk of sowing too much or too little. Fill the seed box with hemp seed, spread a canvas under the feeding tubes, set the indicator at a little less than one-half bushel per acre for wheat, and turn the drivewheel as many times as it would turn in sowing one-tenth acre; then weigh the seed that has fallen on the canvas. If the land is to be drilled in both directions, one-half bushel each way, the drill should feed 2.2 pounds for one-tenth acre. One method giving good results is to remove the lower sections of the feeding tubes on grain drills and place a flat board so that the hemp seed falling against it will be more evenly distributed, the seed being covered either by the shoes of the drill or by a light harrow. Good results are obtained with disk drills, roller press drills, and also with the end-gate broadcast seeder. Drills made especially for sowing hemp seed are now on the market, and they are superseding all other methods of sowing hemp seed in Kentucky. Rolling after seeding is advised, in order to pack the soil about the seed and to secure a smooth surface for cutting, but rolling is not recommended for soils where it is known to have an injurious effect.

AMOUNT OF SEED.

Hemp is sown at the rate of about 3 pecks (33 pounds) per acre. On especially rich soil 1½ bushels may be sown with good results, and on poor land that will not support a

dense, heavy crop a smaller amount is recommended. If conditions are favorable and the seed germinates 98 to 100 per cent, 3 pecks are usually sufficient.

When kept dry, hemp seed retains its germinative vitality well for at least three or four years, but different lots have been found to vary from 35 to 100 per cent, and it is always well to test the seed before sowing.

TIME OF SEEDING.

In Kentucky, hemp seed is sown from the last of March to the last of May. The best results are usually obtained from April seeding. Later seedings may be successful when there is a plentiful rainfall in June. In Nebraska, hemp seed was sown in April, May, or sometimes as late as June. In California it is sown in February or March; in Indiana and Wisconsin, in May. In general, the best time for sowing hemp seed is just before the time for sowing oats in any given locality.

After the seed is sown, the hemp crop requires no further care or attention until the time of harvest.

HARVEST.

TIME.

In California, hemp is cut late in July or in August; in Kentucky, Indiana, and Wisconsin it is cut in September. The hemp should be cut when the staminate plants are in full flower and the pollen is flying. If cut earlier, the fiber will be finer and softer but also weaker and less in quantity. If permitted to become overripe, the fiber will be coarse, harsh, and less pliable, and it will be impossible to ret the stalks properly.

METHODS OF HARVESTING.

HARVESTING BY HAND.

In Kentucky, a small portion of the hemp crop is still cut by hand with a reaping knife or hemp hook. (Pl. XLV, fig. 1.) This knife is somewhat similar to a long-handled corn cutter. The man cutting the hemp pulls an armful of stalks toward him with his left arm and cuts them off as near the base as possible by drawing the knife close to the ground; he then lays the stalks on the ground in a smooth, even row,

with the butts toward him, that is, toward the uncut hemp. An experienced hand will cut with a reaping knife about three-fourths of an acre a day. The hemp stalks are allowed to lie on the ground until dry, when they are raked up by hand and set up in shocks until time to spread for retting.

HARVESTING WITH REAPERS.

Sweep-rake reapers are being used in increasing numbers for harvesting hemp in Kentucky and in all other localities where hemp is raised. (Pl. XLV, fig. 2.) While not entirely satisfactory, they are being improved and strengthened so as to be better adapted for heavy work. Three men, one to grind sections, one to drive, and one to attend to the machine, and four strong horses or mules are required in cutting hemp with a reaper. Under favorable conditions, from 5 to 7 acres per day can be cut in this manner. This more rapid work makes it possible to harvest the crop more nearly at the proper time. The stalks, after curing in the gavel, are set up in shocks, usually without binding into bundles unless they are to be stacked.

HARVESTING WITH MOWING MACHINES.

In some places hemp is cut with ordinary mowing machines. (Pl. XLV, fig. 3.) A horizontal bar nearly parallel with the cutting bar, the outer end projecting slightly forward, is attached to an upright fastened to the tongue of the machine. This bar is about 4 feet above the cutting bar and about 20 inches to the front. It bends the hemp stalks over in the direction the machine is going. The stalks are more easily cut when thus bent away from the knives and, furthermore, the bases snap back of the cutting bar and never drop through between the guards to be cut a second time, as they often do when cut standing erect. With a 5½-foot mowing machine thus equipped, one man and one team of two horses will cut 6 to 8 acres per day. The work is regarded as about equal to cutting a heavy crop of clover. The hemp thus cut all falls in the direction the machine is going, the tops overlapping the butts of the stalks. The ordinary track clearer at the end of the bar clears a path, so that the stalks are not materially injured either by the horses or the wheels of the machine at the next round.

The hemp stalks are then left where they fall until retted, or in places where the crop is heavy the stalks are turned once or twice to secure uniform curing and retting. When sufficiently retted the stalks are raked up with a 2-horse hay-rake, going crosswise of the swaths, and then drawn, like hay, to the machine brake. This is the most inexpensive method for handling the crop. It is impossible to make clean, long, straight fiber from stalks handled in this manner, and it is not recommended where better methods are practicable. It is worthy of more extended use, however, for handling short and irregular hemp, and hundreds of acres of hemp now burned in Kentucky because it is too short to be treated in the regular manner might be handled with profit by this method. There may be nearly as much profit in 3½-cent fiber produced at a cost of 2 cents per pound as in 5-cent fiber produced at a cost of 3 cents, provided the land rent is not too large an item of cost.

NEED FOR IMPROVEMENT IN HEMP HARVESTERS.

The most satisfactory hemp-harvesting machines now in use are the self-rake reapers, made especially for this purpose. They are just about as satisfactory for hemp now as the similar machines for wheat and oats were 30 years ago. More efficient harvesting machinery is needed to bring the handling of this crop up to present methods in harvesting corn or small grain. A machine is needed which will cut the stalks close to the ground, deliver them straight and not bruised or broken, with the butts even, and bound in bundles about 8 inches in diameter. A modified form of the upright corn binder, arranged to cut a swath about 4 feet wide, is suggested. Modified forms of grain binders have been tried, but with rather unsatisfactory results. Green hemp 8 to 14 feet high can not be handled successfully by grain binders; furthermore, the reel breaks or damages a large proportion of the hemp. The tough, fibrous stalks, some of which may be an inch in diameter, are more difficult to cut than grain and therefore require sharp knives with a high motion.

A hemp-reaping machine is also needed that will cut the hemp and lay it down in an even swath, as grain is laid with a cradle. The butts should all be in one direction, and the swath should be far enough from the cut hemp so as not to

be in the way at the next round. A machine of this type may be used where it is desired to ret the hemp in the fall immediately after cutting. It might be used for late crops in Kentucky, or generally for hemp farther north, where there is little danger of "sunburn" after the hemp is harvested.

STACKING.

Hemp stalks which are to be stacked are bound in bundles about 10 inches in diameter, with small hemp plants for bands, before being placed in shocks. (Pl. XLVI, fig. 2.) They are allowed to stand in the shock from 10 to 15 days, or a sufficient length of time to avoid danger of heating in the stack. The bundles are hauled from the shocks to the stacks in rather small loads of half a ton or less on a low rack or sled. Three men with a team and low wagon to haul the stalks can put up two hemp stacks of about 8 tons each in a day.

A hemp stack must be built to shed water. It is started much like a grain stack with a shock, around which the bundles are placed in tiers, with the butts sloping downward and outward. The stack is kept higher in the center and each succeeding outer tier projects slightly to a height of 5 or 6 feet, when another shock is built in the center, around which the bundles are carefully placed to shed water and the peak capped with an upright bundle. A well-built stack may be kept four or five years without injury.

Hemp which has been stacked rets more quickly and more evenly, the fiber is usually of better quality, and the yield of fiber is usually greater than from hemp retted directly from the shock. Hemp is stacked before retting, but not after retting in Kentucky. Stacking retted hemp stalks for storage before breaking is not recommended in climates where there is danger of gathering moisture. Retted stalks may be stored in sheds where they will be kept dry.

CARE IN HANDLING.

Hemp stalks must be kept straight, unbroken, and with the butts even. They must be handled with greater care than is commonly exercised in handling grain crops. When a bunch of loose stalks is picked up at any stage of the operation, it is chucked down on the butts to make them even. The loose stalks, or bundles, are handled by hand and not

with pitchforks. The only tool used in handling the stalks is a hook or rake, in gathering them up from the swath.

RETTING.

Retting is a process in which the gums surrounding the fibers and binding them together are partly dissolved and removed. It permits the fiber to be separated from the woody inner portion of the stalk and from the thin outer bark, and it also removes soluble materials which would cause rapid decomposition if left with the fiber. Two methods of retting are practiced commercially, viz, dew retting and water retting.

DEW RETTING.

In this country dew retting is practiced almost exclusively. The hemp is spread on the ground in thin, even rows, so that it will all be uniformly exposed to the weather. In spreading hemp the workman takes an armful of stalks and, walking backward, slides them sidewise from his knee, so that the butts are all even in one direction and the layer is not more than three stalks in thickness. (Pl. XLIV, fig. 3.) This work is usually paid for at the rate of $1 per acre, and experienced hands will average more than 1 acre per day. The hemp is left on the ground from four weeks to four months. Warm, moist weather promotes the retting process, and cold or dry weather retards it. Hemp rets rapidly if spread during early fall, provided there are rains, but it is likely to be less uniform than if retted during the colder months. It should not be spread early enough to be exposed to the sun in hot, dry weather. Alternate freezing and thawing or light snows melting on the hemp give most desirable results in retting. Slender stalks one-fourth inch in diameter or less ret more slowly than coarse stalks, and such stalks are usually not overretted if left on the ground all winter. Hemp rets well in young wheat or rye, which hold the moisture about the stalks. In Kentucky most of the hemp is spread during December. A protracted January thaw with comparatively warm rainy weather occasionally results in overretting. While this does not destroy the crop, it weakens the fiber and causes much loss. When retted sufficiently, so that the fiber can be easily separated from the hurds, or woody portion, the stalks are raked up and set up in shocks, care being exercised to keep them straight and with the

butts even. They are not bound in bundles, but a band is sometimes put around the shock near the top. The work of taking up the stalks after retting is usually done by piecework at the rate of $1 per acre.

WATER RETTING.

Water retting is practiced in Italy, France, Belgium, Germany, Japan, and China, and in some localities in Russia. It consists in immersing the hemp stalks in water in streams, ponds, or artificial tanks. In Italy, where the whitest and softest hemp fiber is produced, the stalks are placed in tanks of soft water for a few days, then taken out and dried, and returned to the tanks for a second retting. Usually the stalks remain in the water first about eight days and the second time a little longer.

In either dew retting or water retting the process is complete when the bark, including the fiber, readily separates from the stalks. The solution of the gums is accomplished chiefly by certain bacteria. If the retting process is allowed to go too far, other bacteria attack the fiber. The development of these different bacteria depends to a large extent upon the temperature. Processes have been devised for placing pure cultures of specific bacteria in the retting tanks and then keeping the temperature and air supply at the best for their development.[1] These methods, which seem to give promise of success, have not been adopted in commercial work.

CHEMICAL RETTING.

Many processes for retting or for combined retting and bleaching with chemicals have been devised, but none of them have given sufficiently good results to warrant their introduction on a commercial scale. In most of the chemical retting processes it has been found difficult to secure a soft, lustrous fiber, like that produced by dew or water retting, or completely to remove the chemicals so that the fiber will not continue to deteriorate owing to their injurious action.

One of the most serious difficulties in hemp cultivation at the present time is the lack of a satisfactory method of retting that may be relied upon to give uniform results without injury to the fiber. An excellent crop of hemp stalks, capa-

[1] Rossi, Giacomo. Macerazione della Canapa. Annali della Regia Scuola Superiore di Agricultura di Portici, s. 2, v. 7, p. 1-148, 1907.

ble of yielding more than $50 worth of fiber per acre, may be practically ruined by unsuitable weather conditions while retting. Water retting, although less dependent on weather conditions than dew retting, has not thus far given profitable results in this country. The nearest approach to commercial success with water retting in recent years in America was attained in 1906 at Northfield, Minn., where, after several years of experimental work, good fiber, similar to Italian hemp in quality, was produced from hemp retted in water in large cement tanks. The water was kept in circulation and at the desired temperature by a modification of the Deswarte-Loppens system.

STEAMING.

In Japan, where some of the best hemp fiber is produced, three methods of retting are employed—dew retting, water retting, and steaming, the last giving the best results. Bundles of hemp stalks are first immersed in water one or two days to become thoroughly wet. They are then secured vertically in a long conical box open at the bottom and top. The box thus filled with wet stalks is raised by means of a derrick and swung over a pile of heated stones on which water is dashed to produce steam. Steaming about three hours is sufficient. The fiber is then stripped off by hand and scraped, to remove the outer bark. The fiber thus prepared is very strong, but less flexible than that prepared by dew retting or water retting.

BREAKING.

Breaking is a process by means of which the inner, woody shell is broken in pieces and removed, leaving the clean, long, straight fiber. Strictly speaking, the breaking process merely breaks in pieces the woody portions, while their removal is a second operation properly called *scutching*. In Italy and in some other parts of Europe the stalks are broken by one machine, or device, and afterwards scutched by another. In this country the two are usually combined in one operation.

HAND BRAKES.

Hand brakes (Pl. XLVI, fig. 1), with little change or modification, have been in use for many generations, and even yet more than three-fourths of the hemp fiber produced in

Kentucky is broken out on the hand brake. This simple device consists of three boards about 5 feet long set edgewise, wider apart at one end than the other and with the upper edges somewhat sharpened. Above this a framework, with two boards sharpened on the lower edges, is hinged near the wide end of the lower frame, so that when worked up and down by means of the handle along the back these upper boards pass midway in the spaces between the lower ones. A carpenter or wagon maker can easily make one of these hand brakes, and they are sold in Kentucky for about $5.

The operator takes an armful of hemp under his left arm, places the butts across the wide end of the brake near the hinged upper part, which is raised with his right hand, and crunches the upper part down, breaking the stalks. This operation is repeated several times, moving the stalks along toward the narrow end so as to break the shorter pieces, and when the hemp appears pretty well broken the operator takes the armful in both hands and whips it across the brake to remove the loosened hurds. He then reverses the bundle and breaks the tops and cleans the fiber in the same manner.

The usual charge for breaking hemp on the hand brake in this manner is 1 cent to 1½ cents per pound. There are records of 400 pounds being broken by one man in a day, but the average day's work, counting six days in a week, is rarely more than 75 pounds. In a good crop, therefore, it would require 10 to 15 days for one man to break an acre of hemp. The work requires skill, strength, and endurance, and for many years there has been increasing difficulty in securing laborers for it. It is plainly evident that the hemp industry can not increase in this country unless some method is used for preparing the fiber requiring less hand labor than the hand brake.

MACHINE BRAKES.

Several years ago a brake was built at Rantoul, Ill., for breaking and cleaning the fiber rapidly, but producing tow or tangled fiber instead of clean, straight, line fiber, such as is obtained by the hand brake. This machine consisted essentially of a series of fluted rollers followed by a series of beating wheels. Machines designed after this type, but improved in many respects, have been in use several years at Havelock, Nebr., and first at Gridley, then at Courtland and Rio Vista,

Cal. These machines have sufficient capacity and are operated at comparatively small cost, the hurds furnishing more than sufficient fuel for the steam power required, but the condition of the fiber produced is not satisfactory for high-class twines and it commands a lower price than clean, long, straight fiber.

The Sanford-Mallory flax brake, consisting essentially of five fluted rollers with an interrupted motion, producing a rubbing effect, has been used to a limited extent for breaking hemp. This machine, as ordinarily made for breaking flax, is too light and its capacity is insufficient for the work of breaking hemp.

A portable machine brake (Pl. XLVI, fig. 4) has been used successfully in Kentucky during the past two years. It has a series of crushing and breaking rollers, beating and scutching devices, and a novel application of suction to aid in separating hurds and tow. The stalks are fed endwise. The long fiber, scutched and clean, leaves the machine at one point, the tow, nearly clean, at another, and the hurds, entirely free from fiber, at another. It has a capacity of about 1 ton of clean fiber per day.

Another portable machine brake has been in use in California during the past two years, chiefly breaking hemp that has been thoroughly air dried but not retted. This hemp, grown with irrigation, becomes dry enough in that arid climate to break well, but this method is not practicable in humid climates without artificial drying. The stalks, fed endwise, pass first through a series of fluted or grooved rollers and then through a pair of beating wheels, removing most of the hurds, and the fiber, passing between three pairs of moving scutching aprons, each pair followed by rollers, finally leaves the machine in a kind of continuous lap folded back and forth in the baling box.

A larger machine (Pl. XLVI, fig. 3), having the greatest capacity and turning out the cleanest and most uniform fiber of any of the brakes thus far brought out, has been used to a limited extent during the past eight years in Kentucky, California, Indiana, and Wisconsin. This machine weighs about 7 tons, but it is mounted on wheels and is drawn about by a traction farm engine, which also furnishes power for operating it. The stalks are fed sidewise in a continuous layer 1 to 3 inches thick, and carried along so that the ends,

forced through slits, are broken and scutched simultaneously by converging revolving cylinders about 12 and 16 feet long. One cylinder, extending beyond the end of the other, cleans the middle portion of the stalks, the grasping mechanism carrying them forward being shifted to the fiber cleaned by the shorter cylinder. The cylinders break the stalks and scutch the fiber on the under side of the layer as it is carried along, and the loosened hurds on the upper side are scutched by two large beating wheels just as it leaves the machine. The fiber leaves the machine sidewise, thoroughly cleaned and ready to be twisted into heads and packed in bales. This machine with a full crew of 15 men, including men to haul stalks from the field and others to tie up the fiber for baling, has a capacity of 1,000 pounds of clean, straight fiber of good hemp per hour. The tow is thrown out with the hurds, and until recent improvements it has produced too large a percentage of tow. It does good work with hemp retted somewhat less than is necessary for the hand brake, and it turns out more uniform and cleaner fiber. For good work it requires, as do all the machines and also the hand brakes, that the hemp stalks be dry. If the atmosphere is dry at the time of breaking, the hemp may be broken directly from the shocks in the field, but in regions with a moist atmosphere, or with much rainy weather, it would be best to store the stalks in sheds or under cover, and with a stationary plant it might be economical to dry them artificially, using the hurds for fuel. Extreme care must be exercised in artificial drying, however, to avoid injury to the fiber.

IMPROVEMENT NEEDED IN HEMP-BREAKING MACHINES.

While hemp-breaking machines have now reached a degree of perfection at which they are successfully replacing the hand brakes, as the thrashing machines half a century ago began replacing the flail, there is still room for improvement. This needed improvement may be expected as soon as hemp is grown more extensively, so as to make a sufficient demand for machinery to induce manufacturers to invest capital in this line. For small and scattered crops a comparatively light, portable machine is desirable, requiring not more than 10 horsepower and not more than four or five laborers of

average skill for its operation. It should prepare the fiber clean and straight, ready to be tied in hanks for baling, and should have a capacity of at least 1,000 pounds of clean fiber per day. For localities where hemp is grown more abundantly, so as to furnish a large supply of stalks within short hauling distance, a larger machine operated in a stationary central plant by a crew of men trained to their respective duties, like workers in a textile mill, will doubtless be found more economical. Artificial retting and drying may also be used to good advantage in a central plant.

The hemp growers of Europe have adopted machine brakes more readily than the farmers in this country, and the hemp industry in Europe is most flourishing and most profitable where the machines are used. Most of the hemp in northern Italy is broken and scutched by portable machines. Machines are also used in Hungary, and the machine-scutched hemp of Hungary is regularly quoted at $10 to $15 per ton higher than that prepared by hand. These European machines may not be adapted to American conditions, but, together with American machines which are doing successful work, they sufficiently contradict the frequent assertion of hemp growers and dealers that "no machine can ever equal the hand brake."

SORTING.

On many hemp plantations the stalks are roughly sorted before breaking, so that the longer or better fiber will be kept separate. The work of sorting can usually be done best at this point, short stalks from one portion of a field being kept separate from the longer stalks of another portion and overretted stalks from stalks with stronger fiber. Sometimes the men breaking the hemp sort the fiber as it is broken. An expert handler of fiber will readily sort it into two or three grades by feeling of it as it leaves the hand brake or the breaking machine. It is a mistaken policy to suppose that the average price will be higher if poor fiber is mixed with good. It may be safely assumed that the purchaser fixing the price will pay for a mixed lot a rate more nearly the value of the lowest in the mixture, and he can not justly do otherwise, for the fiber must be sorted later if it is to be used to the best advantage in the course of manufacture.

PACKING FIBER FOR LOCAL MARKET.

The long, straight fiber is put up in bundles, or heads, 4 to 6 inches in diameter and weighing 2 to 4 pounds. (Pl. XL, fig. 4.) The bundle of fiber is twisted and bent over, forming a head about one-third below the top end. It is fastened in this form by a few strands of the fiber itself, wound tightly around the neck and tucked in so that it may be readily unfastened without cutting or becoming tangled. Three ropes, each about 15 feet long, twisted by hand from the hemp tow, are stretched on the ground about 15 inches apart. The hanks of fiber are piled crosswise on these ropes with the heads of the successive tiers alternating with the loose ends, which are tucked in so as not to become tangled. When the bundle thus built up is about 30 inches in diameter, the ropes are drawn up tightly by two men and tied. These bundles weigh about 200 pounds each. Most of the hemp leaves the farm in this form. Hemp tow, produced from broken or tangled stalks and fiber beaten out in cleaning the long straight hemp, is packed into handmade bales in the same manner.

HACKLING.

In Kentucky, most of the hemp is sold by the farmers to the local dealers or hemp merchants. The hemp dealers have large warehouses where the fiber is stored, sorted, hackled, and baled. The work of hackling is rarely done on the farms. The rough hemp is first sorted by an expert, who determines which is best suited for the different grades to be produced. A quantity of this rough fiber, usually 112 or 224 pounds, is weighed out to a workman, who hackles it by hand, one head at a time. The head is first unfastened and the fiber shaken out to its full length. It is then combed out by drawing it across a coarse hackle, beginning near the top end and working successively toward the center. When combed a little beyond the center, the bundle of fiber is reversed and the butt end hackled in the same manner. The coarse hackle first used consists of three or four rows of upright steel pins about 7 inches long, one-fourth of an inch thick, and 1 inch apart. The long fiber combed out straight on this hackle is called "single-dressed hemp." This may afterwards be treated in much the same manner on a smaller

hackle with finer and sharper needles set closer together, splitting and subdividing the fibers as well as combing them out more smoothly. The fiber thus prepared is called "double-dressed hemp," and it commands the highest price of any hemp fiber on the American market.

The work of hackling is paid for at a certain rate per pound for the amount of dressed fiber produced. The workman therefore tries to hackle and dress the fiber in such a manner as to produce the greatest possible amount of dressed fiber and least amount of tow and waste. The dressed fiber is carefully inspected before payment is made, and there are few complaints from manufacturers that American dressed hemp is not up to the standard.

A large proportion of the hemp purchased by the local dealers is sold directly to the twine and cordage mills without hackling or other handling except carefully sorting and packing into bales.

BALING.

The bales packed for shipment are usually about 4 by 3 by 2 feet. The following table gives the approximate weights per bale:

Average weight per bale of hemp for shipment to mills.

Class of hemp.	Pounds.
Tow	450
Rough	500
Single dressed	800
Double dressed	900

When cleaned by machine brakes the fiber is often baled directly without packing it in the preliminary handmade bales. In this way it has sometimes escaped the process of careful sorting and has brought unjust criticism on the machines. This cause for criticism may easily be avoided by exercising a little more care in sorting the stalks, and, if necessary, the cleaned fiber.

YIELD.

The yield of hemp fiber ranges from 400 to 2,500 pounds per acre. The average yield under good conditions is about 1,000 pounds per acre, of which about three-fourths are line

fiber and one-fourth is tow. The yield per acre at different stages of preparation may be stated as follows:

	Pounds.
Stalks:	
Green, freshly cut	15,000
Dry, as cured in shock	10,000
Dry, after dew retting	6,000
Long fiber, rough hemp	750
Tow	250

If the 750 pounds of long fiber is hackled it will yield about 340 pounds of single-dressed hemp, 180 pounds shorts, 140 pounds fine tow, and 90 pounds hurds and waste.

The average yields in the principal hemp-producing countries of Europe, based on statements of annual average yields for 5 to 10 years, are as follows:

	Pounds.
Russia	358
Hungary	504
Italy	622
France	662

The yield is generally higher in both Europe and the United States in regions where machine brakes are used, but this is due, in part at least, to the better crops, for machine brakes usually accompany better farming.

COST OF HEMP-FIBER PRODUCTION.

The operations for raising a crop of hemp are essentially the same as those for raising a crop of wheat or oats up to the time of harvest, and the implements or tools required are merely a plow, disk, drill or seeder, a harrow, and a roller, such as may be found on any well-equipped farm. Estimates of the cost of these operations may therefore be based upon the cost of similar work for other crops with which all farmers are familiar. But the operations of harvesting, retting, breaking, and baling are very different from those for other farm crops in this country. The actual cost will, of course, vary with the varying conditions on different farms.

Hemp can not be economically grown in areas of less than 50 acres in any one locality so as to warrant the use of machinery for harvesting and breaking. The following general estimate is therefore given for what may be considered the smallest practical area:

Estimated cost and returns for 50 acres of hemp.

Cost:	
Plowing (in fall) 50 acres, $2 per acre	$100
Disking (in spring), 50 cents per acre	25
Harrowing, 30 cents per acre	15
Seed, 40 bushels, delivered, $4.50 per bushel	180
Seeding, 40 cents per acre	20
Rolling, 30 cents per acre	15
Self-rake reaper for harvesting	75
Cutting with reaper, $1 per acre	50
Picking up from gavels and shocking, $1 per acre	50
Spreading for retting, $1.50 per acre	75
Picking up from retting swath and setting in shocks, $1.40 per acre	70
Breaking 50,000 pounds fiber, including use of machine brake, 1½ cents per pound	750
Baling 125 bales (400 pounds each), including use of baling press, $1.40 per bale	175
Marketing and miscellaneous expenses	150
Total cost	1,750
Returns:	
Long fiber, 37,500 pounds, 6 cents per pound	2,250
Tow, 12,500 pounds, 4 cents per pound	500
Total returns	2,750

It is not expected that a net profit of $20 per acre, as indicated in the foregoing estimate, may be realized in all cases, but the figures given are regarded as conservative where all conditions are favorable.

MARKET.

All of the hemp produced in this country is used in American spinning mills, and it is not sufficient to supply one-half of the demand. The importations have been increasing slightly during the past 20 years, while there has been a decided increase in values. The average declared value of imported hemp, including all grades, for the 4,817 tons imported in 1893, was $142.31 per ton, while in the fiscal year 1913 the importations amounted to 7,663 tons with an average declared value of $193.67 per ton. There have been some fluctuations in quotations, but the general tendency of prices of both imported and American hemp has been upward. (Fig. 19.) The quotations for Kentucky rough prime, since October, 1912, have been the highest recorded for this standard grade. Furthermore, the increasing

FIG. 19.—Variation in market quotations of American, Russian, and Italian hemp, and also of a standard high grade of jute.

demand for this fiber, together with the scarcity of competing fibers in the world's markets, indicates a continuation of prices at high levels.

EFFECT OF TARIFF.

So far as can be determined from records of importations and prices since 1880, the earliest available statistics, the changes in the rate of import duty on hemp have had no appreciable effect on the quantity imported, on the declared import value[1] of the fiber, or on the quantity produced or the price of American hemp in this country. (Fig. 20.) The tariff acts of 1870, 1883, and 1890, in force until 1894, imposed a duty of $25 per ton on line hemp. From 1894 to 1899 hemp was on the free list, and from 1899 to 1913 it was dutiable at $22.50 per ton.

Fig. 20.—Importations and average import price of hemp for 33 years, together with changes in the rate of import duty.

The importations reached a high level in 1899, when hemp was extensively used for binder twine. From that year onward henequen from Yucatan and abacá from the Philippines replaced hemp in binder twine, while jute from India replaced it completely for cotton-bale covering. The increasing demand for hemp for commercial twines has resulted in higher prices for both imported and American hemps, but this demand has been met in this country neither by importation nor by production. There are no accurate statistics of acreage or production in the United States, but there has been a general decline from about 7,000 tons in 1880 to about 5,000 in 1913. The average annual production during the period of free importations, 1894 to 1899, was about 5,000 tons, but slightly less than that of the previous 10

[1] Declared value at port of shipment.

years and about the same as the average of the period of dutiable hemp since then.

The present tariff, 1913, with hemp on the free list, has not been in force long enough to indicate any appreciable effect.

LOCATION OF AMERICAN MILLS.

Some hemp from the larger farms is sold directly to the spinning mills, but most of that produced in this country passes through the hands of local dealers in Kentucky. The hemp imported is purchased either directly from foreign dealers by the mills or through fiber brokers in New York and Boston.

FIG. 21.—Map showing areas (shaded) of hemp cultivation and location (*) of hemp spinning mills in the United States.

There is one twine mill at Frankfort, Ky., on the western edge of the hemp-producing region, and one at Covington, Ky., opposite Cincinnati, but aside from the comparatively small quantities used by these mills and a little used in the mill at Oakland, Cal., practically all the hemp fiber is shipped away from the States where it is produced. There are 28 mills in this country using American hemp, most of them in the vicinity of Boston or New York, as indicated on the accompanying map[1] (fig. 21). In most of these mills other soft fibers, such as jute, China jute, and flax, are also used,

[1] Some of the mills are so close together around New York and Boston that it is impossible to indicate each one by a separate star.

and many of them are also engaged in the manufacture of twines and cordage from the hard fibers—sisal, henequen, abacá (manila), phormium, and Mauritius.

USES.

Hemp is used in the manufacture of tying twine, carpet warp, seine twine, sails, standing rigging, and heaving lines for ships, and for packing. It has been used to some extent for binder twine, but at the relative prices usually prevailing it can not well compete with sisal and abacá for this purpose. Binder twine made of American hemp and India jute mixed has been placed upon the market. This twine is said to give excellent results because it is more smooth and uniform than twine made of hard fiber. The hemp fiber is tougher and more pliable than hard fibers, and the twine is therefore more difficult to cut in the knotter. Hemp is also used to a limited extent for bagging and cotton baling. Only the tow and cheaper grades of the fiber can compete with other fibers for these purposes. The softer grades of hemp tow are extensively used for oakum and packing in pumps, engines, and similar machinery. It endures heat, moisture, and friction with less injury than other fibers, except flax, used for these purposes. Hemp is especially adapted by its strength and durability for the manufacture of carpet warp, hall rugs, aisle runners, tarpaulins, sails, upholstery webbing, belt webbing, and for all purposes in textile articles where strength, durability, and flexibility are desired. Hemp will make fabrics stronger and more durable than cotton or woolen fabrics of the same weight, but owing to its coarser texture it is not well suited for clothing and for many articles commonly made of cotton and wool.

COMPETING FIBERS.

The principal fibers now competing with American-grown hemp are Russian and Hungarian hemp, cotton, and jute. Italian hemp, being water retted, is not only higher in price but it is different in character from the American dew-retted hemp, and it is used for certain kinds of twines and the finer grades of carpet warp for which American hemp is not well suited. Twine made of Italian hemp may, of course, be used sometimes where American hemp twine might serve just as well, but owing to its higher price it is not likely to be used

as a substitute, and it can not compete to the disadvantage of American hemp.

Russian and Hungarian hemp, chiefly dew retted, is of the same character as American hemp and is used for the same purposes. Russian hemp is delivered at the mills in this country at prices but little above those of rough hemp from Kentucky. Most of the Russian and Hungarian hemp imported is of the better grades, the poorer grades being retained in Europe, where many articles are made of low-grade hemp that would be made of low-grade cotton in this country.

In some years, owing to unsuitable weather conditions for retting Kentucky hemp or to greater care in handling Russian hemp and to care in grading the hemp for export from Russia, much of the Russian hemp of the better grades has been stronger and more satisfactory to twine manufacturers than American hemp placed on the market at approximately the same price. It is used for mixing with overretted and weak American hemp to give the requisite strength to twine.

Cotton is now used more extensively than all other vegetable fibers combined. The world's supply of cotton is estimated in round numbers at 5,500,000 tons, valued at nearly $1,000,000,000. The total supply of all other fibers of commerce—hemp, flax, jute, China jute, ramie, sisal, abacá, phormium, Mauritius fiber, cabuya, mescal fiber, and Philippine maguey—amounts annually to about 3,300,000 tons, valued at about $350,000,000. Cotton, therefore, so greatly overshadows all other textile fibers that it may scarcely be regarded as competing directly with any one of them. Cotton is prepared and spun on different kinds of machines from those used for preparing and spinning long fibers. Cotton is not mixed with hemp and is rarely spun in the same mills where hemp is used. Cotton twines do, however, compete [illegible] hemp tying twines, and cotton is largely used for carpet [illegible] [illegible]emp, with its superior strength and durability, [illegible] [illegible]ice. Less than a century ago hemp [illegible] [illegible]re extensively than cotton, but the [illegible] [illegible]n gin, followed by the rapid develop[illegible] [illegible]ong the line for preparing and spin[illegible] [illegible] has been no corresponding de[illegible] [illegible]reparing and spinning hemp or [illegible] [illegible]tton the supremacy among veg[illegible] [illegible] will regain

the supremacy over cotton, even with improved machinery for handling the crop and spinning the fiber, because cotton is better adapted to a wide range of textile products. Hemp should, however, regain many of the lines where it will give better service than cotton.

Jute is the most dangerous competitor of hemp. Jute is produced in India from the bast or inner bark of two closely related species of plants, jute (*Corchorus capsularis*) and nalta jute (*Corchorus olitorius*). These plants are somewhat similar in appearance to hemp, though not at all related to it. They are grown on the alluvial soils in the province of Bengal, India, and to a much less extent in other parts of India, southern China, and Taiwan (Formosa). More than 3,000,000 acres are devoted to this crop, and the annual production is approximately 2,000,000 tons of fiber, valued at $150,000,000. The plants are pulled by hand, water retted in slow streams or stagnant pools, and the fiber cleaned by hand without the aid of even crude appliances as effective as the hand brake for hemp. Jute fiber thus prepared, cleaner, softer, and more easily spun than Kentucky rough-prime hemp, is delivered in New York at an average price of about 4 cents per pound for the better grades. Jute butts, consisting of the coarser fiber cut off at the base, 5 to 10 inches long, are sold in this country at 1 to 2 cents per pound. Most of the long jute fiber comprising the "light jute" grades are of a light straw color, while the "dark jutes," also called "desi jute," are of a dark, brownish gray. The fresh fiber of both kinds when well prepared is lustrous, but with age it changes to a dingy, brownish yellow.

Fresh jute fiber is about two-thirds as strong as hemp fiber of the same weight, but jute lacks durability and rapidly loses its strength even in dry air, while if exposed to moisture it quickly goes to pieces. It is not suitable for any purpose where strength or durability is required.

Jute is used most extensively for burlaps, gunny bags, sugar sacks, grain sacks, wool sacking, and covering for cotton bales. Hemp has been used for all of these purposes, but the cheaper jute fiber now practically holds the entire field in the manufacture of coverings for agricultural products in transit. This is a legitimate field for jute, where it constitutes a "gift package," generally to be used but once, but even in this field hemp may regain some of its uses where it is found that jute does not give sufficient strength or durability.

Jute is often used as an adulterant or as a substitute for hemp in the manufacture of twines, webbing, carpet warp, and carpets. The careless use of the name hemp to indicate jute aids in facilitating this substitution. Twine made of pure jute fiber is sold as "hemp twine" in the retail stores in Lexington, Ky., in the heart of the hemp-growing region. Many of the so-called hemp carpets and hemp rugs are made only of jute, and they wear out quickly, whereas a carpet made of hemp should be as durable as one made of wool. Jute is substituted for hemp very largely in the manufacture of warp for carpets and rugs, a purpose for which its lack of strength and durability makes it poorly fitted. It is to the interest of the purchaser of manufactured articles as well as to the producer of hemp and the manufacturer of pure hemp goods that the line between hemp and jute be sharply drawn. Unfortunately, the difference in the appearance of the fibers by which they may be distinguished is not as strongly marked as the differences between their strength and wearing qualities.

TESTS FOR DISTINGUISHING BETWEEN JUTE AND HEMP.

There are no satisfactory tests for these fibers without the aid of a microscope and chemical reagents. A ready, but uncertain, test consists in untwisting the end of twine or yarn. Jute fiber thus unwound is more fuzzy and more brittle than hemp. The two fibers may be distinguished with certainty with a microscope and chemical reagents, as indicated by the differences in the table which follows:

Reactions of hemp and jute.[1]

Test.	Hemp.	Jute.
Schweitzer's	Clean fiber dissolved.	Bluish color, more or less distinct swelling.
Iodin and sulphuric acid	Greenish blue to pure blue.	Yellow to brown.
Anilin sulphate	Faint yellow	Golden yellow to orange.
Warming in weak solution of nitric acid and potassium chromate, then washing and warming in dilute solution of soda ash and washing again; place on microscopic slide, and when dry add drop of glycerol. Use polariscope (dark field).	Uniform blue or yellow.	Prismatic colors.

[1] Matthews, J. Merritt. The Textile Fibers, p. 349, 1906.

At the present high prices of jute (fig. 4), resulting from increasing demands in foreign markets and a partial failure of the crop in India, jute could not compete successfully with hemp were it not that manufacturers are using it in established lines of goods, and, further, that they are uncertain about securing supplies of hemp.

SUMMARY.

Hemp is one of the oldest fiber-producing crops and was formerly the most important.

The cultivation of hemp is declining in the United States because of the (1) increasing difficulty in securing sufficient labor for handling the crop with present methods, (2) lack of labor-saving machinery as compared with machinery for handling other crops, (3) increasing profits in other crops, (4) competition of other fibers, especially jute, and (5) lack of knowledge of the crop outside of a limited area in Kentucky.

Hemp was cultivated for fiber in very early times in China.

The history of the distribution of hemp from Asia to other continents indicates its relationships and the development of the best fiber-producing types.

Hemp is cultivated in warm countries for the production of a narcotic drug, but for fiber only in moderately cool and humid temperate regions.

Very few well-marked varieties of hemp of fiber-producing types have been developed.

The climate and soils over large areas in the valley of the Mississippi and its tributaries and in the Sacramento and San Joaquin Valleys in California are suited for hemp.

Hemp improves the physical condition of the soil, destroys weeds, and when retted on the ground, as is the common practice, does not exhaust fertility.

Hemp is recommended for cultivation in regular crop rotations to take the place of a spring-sown grain crop.

Fertilizers are not generally used in growing hemp, but barnyard manure applied to previous crops is recommended.

Hemp is rarely injured by insects or fungous diseases.

Broom rape, a root parasite, is the most serious pest in hemp.

Practically all of the hemp seed used in the United States is produced in Kentucky.

The best seed is obtained from plants cultivated especially for seed production, but some seed is obtained from broadcast overripe fiber crops.

The land should be well plowed and harrowed, so as to be level and uniform.

The seed should be sown early in spring by any method that will distribute and cover it uniformly.

Some hemp is still cut by hand in Kentucky, but the use of machinery for harvesting the crop is increasing.

Dew retting is regarded as the most practical method in this country.

Hand brakes for preparing the fiber are still used, but they are being replaced by machines.

The price of hemp has been generally increasing during the past 30 years.

About 30 different spinning mills in the United States, beside dealers in oakum supplies, offer a market for raw hemp fiber.

The market would expand if manufacturers could be assured of larger supplies.

India jute, often retailed under the name hemp, is the most dangerous competitor of hemp.

THE SOUTH AMERICAN MEAT INDUSTRY.

By A. D. Melvin,
Chief of the Bureau of Animal Industry.

IT is well known that the domestic supply of meat in the United States, especially of beef, has in recent years shown an alarming decrease, so much so, in fact, that for the first time in our history it has become necessary to look to the foreign field for relief. Certain distant countries, having sparse populations and vast herds and flocks combined with abundant natural grazing facilities, have now taken the place of the United States as the world's great source of the meat surplus. South America and the Australian colonies, particularly the former, have in the last decade produced immense quantities of beef and mutton for export, and already shipments have been received in our ports from these places, mostly of beef from Argentina, with a probability that the trade will soon grow to considerable proportions. In view of these facts, and pursuant to the instructions of the Secretary of Agriculture, an investigation of the South American meat inspection and meat industry was made by the writer in the late summer of 1913, the results of which, together with the main facts connected with live-stock conditions and the meat trade of the South American countries, are herewith given.

The investigation was undertaken primarily for the purpose of ascertaining at first hand whether the meat inspection was adequate and whether the conditions under which food animals were slaughtered and the meat prepared for export were such as would reasonably insure that the product was sound and healthful, as is required by our laws. To dispose of this point at the outset it may be stated that the official inspection of meat for export, as observed at the various establishments engaged in this trade, was on the whole satisfactory. Some more or less important details, however, were not in accordance with the practice of the Federal meat inspection as administered by this bureau, but in this connection it should

be said that the chief of the Argentine Bureau of Animal Industry was very desirous of having the inspection brought up to a standard satisfactory to the United States Government, and it was stated that a request has been made through the Argentine minister at Washington that an inspector of this Government be sent to Argentina to instruct the inspection authorities there in detail regarding such matters, the Argentine Government agreeing to pay his expenses.

Every facility and courtesy was extended by the Argentine Government in connection with the investigation, free railroad transportation was provided, and a veterinary inspector of the Argentine Bureau of Animal Industry, who was familiar with English, was detailed to act as guide.

The Federal Governments of both Argentina and Uruguay maintain veterinary inspection at all of the establishments exporting fresh meats, the Federal inspection being confined to animals and meats intended for export. Municipal abattoirs are maintained very generally at the more important South American cities, and local meat supplies are slaughtered at these places under municipal inspection.

IMPORTS OF FOOD ANIMALS AND MEAT PRODUCTS INTO THE UNITED STATES.

The fact that an import trade in food animals and meat-food products has already become well established is shown in the following statements, compiled from the records of this bureau, which cover the operations during six months, from October, 1913, to March, 1914.

Imports of food animals into the United States, October, 1913, to March, 1914.

Month and country of export.	Cattle.	Swine.	Sheep.	Goats.
1913.				
October:	*Number.*	*Number.*	*Number.*	*Number.*
Mexico	47,442	119	40,147	41,542
Canada	80,583	42	2,841	5
Other countries	434	....	24	2
Total	128,459	161	43,012	41,549
November:				
Mexico	40,825	410	27,426	18,793
Canada	40,030	182	10,027	....
Other countries	2	....	6	2
Total	80,857	592	37,459	18,795

Imports of food animals into the United States, October, 1913, to March, 1914—Continued.

Month and country of export.	Cattle.	Swine.	Sheep.	Goats.
1913.	*Number.*	*Number.*	*Number.*	*Number.*
December:				
Mexico	69,544	211	33,737	22,449
Canada	14,010	4,241	280	1
Other countries	56	....	17	7
Total	83,610	4,452	34,034	22,457
1914.				
January:				
Mexico	84,583	82	12,165	17,169
Canada	4,264	8,730	34	....
Other countries	....	....	....	....
Total	88,847	8,812	12,199	17,169
February:				
Mexico	107,799	48	1,148	19,845
Canada	2,221	8,189	62	....
Other countries	....	....	....	....
Total	110,020	8,237	1,210	19,845
March:				
Mexico [1]	33,097	64	2,036	13,174
Canada	3,584	8,192	17	....
Other countries	....	....	....	....
Total	36,681	8,256	2,053	13,174

[1] The figures for Mexico for March are preliminary and subject to revision.

Imports of meats and meat food products into the United States, October, 1913, to March, 1914.

Month and country of export.	Fresh and refrigerated meats.		Canned and cured meats.	Other products.	Total.
	Beef.	Other meats.			
1913.	*Pounds.*	*Pounds.*	*Pounds.*	*Pounds.*	*Pounds.*
October:					
Argentina	2,069,794	....	....	46,070	2,115,864
Canada	2,337,272	6,900	148,127	8,809	2,501,108
Australia	653,145	2,179	152,280	....	807,604
Uruguay	559,843	....	....	....	559,843
Other countries	5,357	9,915	280	764	16,316
Total	5,625,411	18,994	300,687	55,643	6,000,735

Imports of meats and meat food products into the United States, October, 1913, to March, 1914—Continued.

Month and country of export.	Fresh and refrigerated meats.		Canned and cured meats.	Other products.	Total.
	Beef.	Other meats.			
1913.					
November:	*Pounds.*	*Pounds.*	*Pounds.*	*Pounds.*	*Pounds.*
Argentina	3,988,898	10,204	31,025	63,709	4,093,836
Canada	4,811,998	179,727	611,701	21,976	5,625,402
Australia	1,681,156		236,382		1,917,538
Other countries	27,252	14,785	18,035	124,041	184,113
Total	10,509,304	204,716	897,143	209,726	11,820,889
December:					
Argentina	9,440,488	237,422	130,176	546,588	10,354,674
Canada	2,048,475	149,503	357,178	46,117	2,601,273
Australia	1,286,193	83,868	484,774	60	1,854,895
Uruguay	494,454				494,454
Other countries	25,417	347	105,185	638,275	769,224
Total	13,295,027	471,140	1,077,313	1,231,040	16,074,520
1914.					
January:					
Argentina	8,935,797	290,317	16,600	612,990	9,855,704
Canada	595,011	212,320	251,417	41,837	1,100,585
Australia	2,330,699	418,889	918,454		3,668,042
Uruguay	777,033		132,978		910,011
Other countries	148,453	4,237	110,054	199,648	462,392
Total	12,786,993	925,763	1,429,503	854,475	15,996,734
February:					
Argentina	4,346,565		50,801	222,115	4,619,481
Canada	347,933	278,751	163,974	19,637	810,295
Australia	977,746	186,300	671,019		1,835,065
Uruguay	2,401,855	892,225	6,759		3,300,839
Other countries		5,881	67,402	127,323	200,606
Total	8,074,099	1,363,157	959,955	369,075	10,766,286
March:[1]					
Argentina	20,784,393	1,663,542	102,375	60,120	22,610,430
Canada	540,408	379,641	260,941	70,873	1,251,863
Australia	1,389,877	478,834	717,765	21,753	2,608,229
Uruguay	5,783,602	423,804	72,654	2,400	6,282,460
Other countries		11,219	148,422	106,016	265,657
Total	28,498,280	2,957,040	1,302,157	261,162	33,018,639

[1] The figures for March are preliminary and subject to slight revision.

THE SOUTH AMERICAN EXPORT MEAT TRADE.

The only South American countries exporting refrigerated meats are Argentina and Uruguay. The large exporting establishments are situated mostly on the River Plate, and the frozen and chilled meats are in most cases loaded directly into the ocean steamers. The export trade in refrigerated meats owes its beginning and development to the invention by a French engineer, Charles Tellier, of a system for preserving fresh meats by refrigeration during the time required for the ocean voyage from South America to Europe. The pioneer steamship in this trade, *Le Frigorifique,* constructed with refrigerating facilities according to the Tellier system, made a successful trial voyage with fresh meat from Rouen, France, to Buenos Aires in 1876. In the following year this vessel and *Le Paraguay* began the transportation of frozen meat from Argentina to Europe under the respective management of two French firms, the Tellier and Jullien companies, which were given a five-year monopoly by the Argentine Government.

Incidentally it may be noted that Tellier, who was known as "the father of cold storage," recently died at an advanced age in Paris in the utmost poverty, having refused proffered assistance.

In 1883 the frozen-meat industry was definitely established in Argentina by the erection of the "Campana" plant, which was soon followed by other establishments.

In 1907 a United States packing firm acquired one of the Argentine plants, and four of the large establishments are now under United States ownership. English capital is also invested in several plants. The competition between the United States firms on the one hand and the native or Anglo-Argentine on the other is very keen. These establishments that prepare and export refrigerated meats are known as "frigoríficos." There are now 10 in Argentina and 2 in Uruguay, as shown in the following list, compiled from the report of the Argentine Commission to the recent Cold Storage Congress at Chicago. It is understood that two new plants in Argentina will soon be in operation also, namely, the Union Cold Storage Co., at Zárate, owned by an English firm, and the Compañia Frigorífico Santiago, at La Plata, owned by Armour & Co.

South American companies and establishments producing refriger
for export.

Name of company.	Capital stock (gold) 1912.	Name of establishment.	Lo
The River Plate Fresh Meat Co. (Ltd.).	$2,250,000	Campana	Provin Aires
Compañia Sansinena de Carnes Congeladas.	4,500,000	La Negra	Do.
Do		Cuatreros	Do.
Do		Frigorífica Uruguaya	Urugu
Las Palmas Produce Co. (Ltd.)	2,500,000	Las Palmas	Provin Aires
Compañia Argentina de Carnes Congeladas.	1,500,000	La Blanca	Do.
La Plata Cold Storage Co. (Ltd.)	5,000,000	La Plata	Do.
Frigorífico Montevideo		Montevideo	Urugu
The Smithfield and Argentine Meat Co. (Ltd.).	1,250,000	Zárate	Provin Aires
Sociedad Anónima Frigorífico Argentino.	2,000,000	Argentino	Do.
The New Patagonian Meat Preserving and Cold Storage Co. (Ltd.) (branch of La Plata).	2,608,607	Río Gallegos	Patago
Do		San Julian	Do.

Regarding the United States ownership in the abov American refrigerating companies, from our present i tion it may be stated that the two establishments, L and Frigorífico Montevideo, the latter in Uruguay, w two branches in Patagonia, are owned by the Swift Co the La Blanca plant is owned by Morris & Co. and Ar Co., and the Frigorífico Argentino has been leased Sulzberger Company.

The following table shows the exports of Argentine erated meat since the commencement of the trade. n chilled beef with a corresponding decline i ecent years shows a growing prefere great bulk of the exports has gone

FIG. 1.—TYPE OF CATTLE SLAUGHTERED FOR THE EXPORT TRADE.

FIG. 2.—YOUNG CATTLE ON A TYPICAL RANCH IN THE ALFALFA REGION.

ARGENTINE CATTLE.

FIG. 1.—BEEF IN AN ARGENTINE FRIGORÍFICO.

FIG. 2.—MUTTON IN AN ARGENTINE FRIGORÍFICO.

EXPORT MEAT IN ARGENTINA.

FIG. 1.—STOCK CAR.

FIG. 2.—UNLOADING A TRAIN OF CATTLE FROM THE END CAR.

LIVE-STOCK TRANSPORTATION IN ARGENTINA.

FIG. 1.—LOADING BEEF FOR EXPORT IN ARGENTINA.

FIG. 2.—SHORTHORN BULL AT PALERMO STOCK SHOW, ARGENTINA. SOLD AT AUCTION FOR $35,000 GOLD.

Argentine exports of beef and mutton.

Year.	Beef.		Mutton (frozen).	Year.	Beef.		Mutton (frozen).
	Frozen.	Chilled.			Frozen.	Chilled.	
	Quarters.	*Quarters.*	*Carcasses.*		*Quarters.*	*Quarters.*	*Carcasses.*
1884	112	....	152,605	1899	113,984	....	2,485,949
1885	1,193	....	368,145	1900	266,283	....	2,385,482
1886	3,702	....	501,885	1901	479,372	24,919	2,755,788
1887	2,729	....	653,297	1902	735,715	94,498	3,423,285
1888	2,908	....	743,742	1903	877,342	142,542	3,427,783
1889	8,110	....	848,277	1904	1,018,072	198,300	3,679,587
1890	1,003	....	970,904	1905	1,533,745	426,002	3,346,670
1891	8,849	....	968,695	1906	1,580,589	455,459	2,785,908
1892	11,824	....	1,206,406	1907	1,403,835	849,613	2,802,014
1893	52,105	....	1,299,605	1908	1,579,163	789,348	3,297,667
1894	3,735	....	1,594,367	1909	1,615,888	1,071,474	2,723,870
1895	21,890	....	2,022,650	1910	1,434,078	1,608,608	2,843,676
1896	37,420	....	1,992,304	1911	1,693,494	2,131,791	3,497,639
1897	53,984	....	2,155,169	1912	2,086,780	2,269,474	3,266,755
1898	71,463	....	2,542,529	1913 (6 mos.)	978,498	1,384,085	968,007

The following tables show the exports in detail of food animals and meat food products from Argentina in 1912; also the destination of the principal items as officially reported by the Argentine Government:

Exports of food animals and meat food products from Argentina in 1912.

Item.	Quantity.	Value (gold).[1]
Live animals:		
Cattle .... number..	261,416	$9,140,080
Sheep .... do....	104,898	314,694
Goats .... do....	7	17
Swine .... do....	9	270
Meat food products:		
Beef, chilled and frozen .... tons..	342,851	34,285,076
Mutton, frozen .... do....	70,175	5,613,971
Pork .... do....	2,582	2,111,177
Tongues, conserved .... do....	632	189,523
Dried beef (tasajo) .... do....	8,824	1,400,748
Other frozen meat .... do....	15,661	1,017,992
Concentrated soup .... do....	658	197,433
Canned meat .... do....	17,699	1,769,882
Meat extract .... do....	612	1,223,860
Powdered meat .... do....	3,374	1,349,557
Lard .... do....	3	657
Oleomargarin .... do....	6,264	939,534
Oleo stock .... do....	75,556	11,314,728
Total value	....	70,869,199

[1] Argentine gold peso equals $0.9647 United States.

Destination of principal meat food exports from Argentina in 1912.

Item.	United Kingdom.	Italy.	Belgium.	France.	United States.	Uruguay.	Brazil.
Cattle................number..	....	15,689	....	....	....	90,025	72,103
Sheep....................do....	....	15,738	22,785	....	....	37,304	13,888
Beef....................tons..	303,099	9,522	25	192	....	....	....
Mutton..................do....	69,534	70	11	405	....	....	....
Pork....................do....	176	277	936	252	679	....	6
Dried beef..............do....	40	....	....	19	301	....	1,913
Oleo stock..............do....	29,771	5,096	3,787	4,368	1,210	....	1,037

The total value of all exports of animals and animal products from Argentina in 1912 as given in the report referred to was $188,215,926 gold, an increase of $19,821,223 compared with 1911. This total includes, however, not only food animals and meat food products, but various other animals and products, such as horses, hides, wool, leather, and sundry other inedible products.

PRICES OF ARGENTINE EXPORT CATTLE AND MEAT.

In September, 1913, cattle in Argentina that would dress about 800 to 820 pounds were selling on the hoof at $70 to $80 gold, with freight. This grade of Argentine beef, which is of very high quality, was selling in England for from 8 to 9 cents a pound wholesale. The London quotations of October 10, 1913, for South American dressed beef ranged from 6½ to 11 cents a pound for chilled beef and 6¼ to 8½ cents for frozen beef. Besides the price received for the meat there is a considerable return from the hide and offal, and since the entrance of American packers into the South American trade these by-products are being carefully prepared and utilized.

A very high quality of mutton is also produced in Argentina, but at this time shipments were scarce, on account of the floods which were quite prevalent in sections of the Province of Buenos Aires and farther south. London quotations for South American mutton October 10 were 8 to 8¼ cents a pound. An idea of the quality of the Argentine export meat may be gained from Plates XLVII and XLVIII, although in regard to the cattle it may be said that those slaughtered

for the refrigerated trade are frequently in fatter condition than is seen in the illustration.

The relative prices of Argentine beef and mutton on the London market on October 10, 1913, as compared with the prices of high-grade meat in the principal markets of the United States and Europe at about the same date were as follows:

Wholesale prices per pound of beef and mutton in October, 1913.

		Cents.
BEEF.		
Chicago:		
Good native steers	sides	12¾–13¼
New York:		
Choice native heavy	do	13½–14
London:		
English beef	do	11½–13
South American chilled	hinds	10–11
Do	fores	6½–7
South American frozen	hinds	8¼–8½
Do	fores	6¼
Berlin:		
Fat oxen	sides	19½–20½
Paris:		
Beef	hinds	9¾–15½
Do	fores	6¼–10¼
MUTTON.		
Chicago:		
Good sheep	carcass	9½
New York:		
Choice sheep	do	10
London:		
English wethers	do	13–15½
South American frozen	do	8–8¼
Berlin:		
Fat wethers	do	18–20
Paris:		
First quality	do	20–21

THE QUARANTINE STATION FOR IMPORTED LIVE STOCK AT BUENOS AIRES, ARGENTINA.

The quarantine yards for imported live stock were visited on August 21, 1913. The station is situated alongside the docks. Government attendants unload the animals, which remain under their supervision and care until released from quarantine. Cattle are held in quarantine 30 days, sheep 15 days, and hogs 3 days from the time of landing. Neither

the owners nor any of their attendants are permitted within the quarantine premises. All temporary fittings upon the steamers are burned. Cattle are submitted to the tuberculin test and horses to the mallein test and all animals to a daily veterinary inspection. After unloading, all animals are submitted to external disinfection. Sheep are shorn and disinfected before being released from quarantine. Eleven camels were in quarantine at the time, having been imported from the Canary Islands to determine by experiment whether they may be used as beasts of burden in certain arid regions of the Republic.

LA TABLADA SHEEP YARDS

On August 25, 1913, a visit was paid to the sheep stock yards at La Tablada, about 12 miles from Buenos Aires. The average daily receipts are said to be about 7,000, although as high as 40,000 have been received in a single day. The receipts on the day of the visit were very light, being about 1,680, and had been disposed of before my arrival. Last year 4,500,000 sheep were received and during the first six months of this year 1,200,000 were handled. Veterinary inspection is maintained at these yards and a dipping vat is provided for treating infected and exposed sheep. Sheep that are to be removed to the country for feeding having been found scabby must be dipped twice at a cost of 15 cents (paper) per head each time, or the owner must pay a fine of 50 cents per head, submit to one dipping, and then sell the sheep for slaughter. These provisions apply in case a herd is found with over 5 per cent with scab. In case a less percentage is found the remedies are left to the discretion of the bureau. Scabies appears in the most aggravating form in the Lincoln breed, which is considered more susceptible to this disease than other breeds. Sheep are ordinarily transported in double-decked cars which do not have a roof. Sheep are bought in these yards for both local markets and frigoríficos.

THE VETERINARY COLLEGE OF THE ARGENTINE NATIONAL UNIVERSITY.

This school, which is located at La Plata, Argentina, was visited on August 26, 1913. Each student must take certain prescribed courses, which include dairying and animal husbandry. There are no electives. In the four years a course

in meat inspection is given. In general the various subjects are taught in separate buildings. The equipment is modern and apparently sufficient. A large clinic is also maintained, there being on hand at the time of our visit 60 patients. The school is under the direction of Dr. C. Griffin, an Argentinian, educated at home. Eighty students now attend. The writer was informed that there was another veterinary school in Argentina, near Buenos Aires, and also one at Montevideo, Uruguay, but it was impossible to arrange time to visit them.

TRANSPORTATION OF CATTLE TO THE FRIGORÍFICOS.

The cattle slaughtered in the frigoríficos are usually shipped directly from the ranches to the establishments in trainload lots. The railroads make a minimum charge for a train of 20 cars of cattle, whether the train contains that many cars or not. Small lots of cattle which may go to public markets are charged for by the car and shipped in with other freight.

Cattle cars are arranged with the doors in the ends. In loading and unloading the train is backed up to the platform and the animals pass in and out at the end of the rear car and through that to and from other cars, the ends being arranged so as to open toward each other in the form of vestibules, allowing continuous passage from one end of the train to the other. Some of the cars are covered and some are not. They hold an average of about 17 fat cattle. The style of the cars and the method of unloading cattle are illustrated in Plate XLIX.

ARGENTINE CATTLE AND PASTURES.

Nearly all of the cattle slaughtered in the frigoríficos are either raised upon alfalfa pastures or are brought in from native grass pastures and finished on alfalfa. These cattle as a rule are highly bred, the principal breeds being the Durham (Shorthorn), Hereford, and Polled Angus, ranking numerically in the order named. As a rule these alfalfa pastures will maintain the year round one adult steer upon 2½ acres of land, while in the fattening period this is increased to 3 to 3½ acres. Usually no other feed is used to supplement the alfalfa pastures except in occasional times of drought or invasion of locusts, although some owners are beginning to finish their cattle on corn. With some cattle growers it is the practice to turn cattle for a short period on the native

grass pastures rather than keep them constantly on the alfalfa pastures, as they believe this is beneficial.

Alfalfa is not being grown nearly as extensively as it could be. The extension of its growth will depend very largely upon the prices that the cattle raisers receive for their cattle. Because of present satisfactory prices the tendency now is to convert the grain lands into alfalfa pastures. As cattle raising is a much more certain enterprise than grain growing, the people prefer to raise cattle when the prices are remunerative.

A visit was made to two large ranches in Argentina, namely, the establishment of Mr. Robert Murphy, "La Anita Rancho," at Cambaceres, in the Province of Buenos Aires, and that of Mr. James P. Cavanagh, at La Chispa, in Santa Fe Province. The illustration in Plate XLVII shows the nature of the land and the character of the cattle raised on these ranches, which are in the alfalfa district of Argentina. These ranches are typical of the establishments of the progressive cattle raisers.

Argentina for many years has been importing the best breeding cattle and sheep from Great Britain, and to-day has some of the finest types in the world. A visit was made to the National Live Stock Show at Palermo given by the Argentine Rural Society, also the fair at Rosario given by the Rural Society of the Province of Santa Fe. At Palermo the entries comprised 2,438 animals, including 1,334 cattle, 270 horses, 672 sheep, 151 swine, and 11 goats, besides 882 fowls. Most of the animals were pedigreed stock. A splendid example of the animals exhibited at Palermo is shown in Plate L, fig. 2. In order to avoid any possibility of favoritism, the judges for the show at Palermo were all brought from Europe for the special purpose of judging at this show.

It is the practice in Argentina for cattle growers to pay their taxes upon cattle at the time of selling them. This seems to be a fairer arrangement than to require stock owners to pay the tax on growing cattle from year to year.

ANIMAL DISEASES IN ARGENTINA.

Coccidiosis[1] and actinobacillosis[2] are quite common diseases among live stock in Argentina, and foot-and-mouth disease is also common, at sôme periods extending over a large section of the country. Tuberculosis is not prevalent except among dairy cows, work oxen, and bulls. Screw worms are a very common affliction and require close attention during the summer months. The bloating of cattle from alfalfa is not considered a very serious menace, most ranches keeping rock salt available for the cattle at all times and some placing this in their drinking troughs. When bloating occurs, the usual relief is furnished by puncturing the rumen with a long sheath knife, which all "gauchos" (cowboys) carry in the belt.

URUGUAY.

Uruguay has a good grade of cattle, but in general they are not equal to those in the alfalfa region of Argentina. The country, although very small in comparison with the neighboring Republics of Argentina and Brazil, nevertheless has an area of 72,210 square miles, a large proportion of which is well watered and naturally suited for stock raising, which is the principal industry. Furthermore, the southern part of the country is bounded by the River Plate, upon the other shore of which is Argentina, and in this vicinity are situated most of the great meat packing and exporting establishments. The Uruguayan Government, also, has in recent years been making a determined bid for a share of the export trade. It is therefore highly probable that the production of meat for the foreign trade will increase both in quantity and quality. Some examples of improved animals are seen in Plates LI, LII, and LIII.

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[1] Coccidiosis is an infection of the intestinal tract by minute animal parasites known as coccidia.

[2] Actinobacillosis is a disease with lesions somewhat similar in appearance to those of lumpy jaw (actinomycosis). It is caused by a bacillus, while actinomycosis is caused by a fungus.

The following tables show the extent of the Uruguayan meat trade for a series of years:

Animals slaughtered and meat produced at frigoríficos in Uruguay.

Year.	Cattle.	Sheep.	Frozen beef.	Frozen mutton.	Other frozen meats.
			Kilos.	*Kilos.*	*Kilos.*
1905	3,982	72,421	1,006,717	1,644,158	98,773
1906	4,093	93,689	1,066,352	2,154,743	118,465
1907	12,104	117,400	3,170,248	2,873,722	209,837
1908	21,856	143,099	5,749,128	3,205,419	318,260
1909	26,711	150,358	6,973,571	3,353,005	367,688
1910	34,127	241,418	8,634,888	5,552,783	500,754
1911	23,231	288,465	....	....	....
1912	68,481	333,544	....	....	....
1913 (first half)	69,512	258,094	....	....	....

CURED OR SALTED BEEF ("TASAJO").

South American countries produce and export considerable quantities of cured or salted beef, known as "tasajo" or "jerked beef," much of which goes to Central America and Cuba. As an example of the importance of this industry, statistics of cattle slaughtered at the "saladeros" (salting establishments) of Uruguay are given in the following table:

Cattle slaughtered at Uruguayan saladeros.

Year.	Cattle.	Year.	Cattle.	Year.	Cattle.	Year.	Cattle.
1892	480,200	1898	496,700	1904	685,400	1910	609,300
1893	877,400	1899	684,300	1905	440,800	1911	446,600
1894	640,500	1900	597,500	1906	550,000	1912	577,31
1895	712,200	1901	512,000	1907	548,800	1913 (first half)	178,274
1896	518,900	1902	557,500	1908	467,400		
1897	570,400	1903	544,600	1909	544,900		

BRAZIL.

In Brazil observations were made in the cities of São Paulo, Rio de Janeiro, and Santos, and also on a cattle ranch in the interior.

The cattle of Brazil are not of such good quality as those of Argentina and Uruguay, and the stock is largely mixed

FIG. 1.—SHORTHORN BULL.

FIG. 2.—HEREFORD BULL.

PRIZE CATTLE AT STOCK SHOW IN URUGUAY.

FIG 1.—PRIZE ABERDEEN-ANGUS CALF

FIG. 2.--CHAMPION MIDDLE WHITE YORKSHIRE BOAR.

LIVE STOCK IN URUGUAY.

PRIZE SHEEP AT STOCK SHOW IN URUGUAY.

FIG. 1.—BRAZILIAN CATTLE FOR SLAUGHTER AT MUNICIPAL ABATTOIR, SÃO PAULO, BRAZIL.

FIG. 2.—SHORTHORN BULLS IMPORTED FROM THE UNITED STATES BY THE BRAZIL LAND, CATTLE, AND PACKING COMPANY.

CATTLE IN BRAZIL.

with the zebu or East Indian cattle. This zebu strain is very readily seen in most of the Brazilian cattle, and may be observed in some of the animals shown in Plate LIV, figure 1.

The ranch referred to is owned by the Brazil Land, Cattle & Packing Co., and is situated in the Province of Parana. This company has imported several hundred pure-bred Shorthorn and Hereford bulls and cows for the purpose of improving its cattle. These imported cattle were all immunized against Texas fever before leaving the United States, but besides this disease, which exists in Brazil as in the southern part of the United States, there is also said to be prevalent another disease very similar to Texas fever, known as anaplasmosis, which is also caused by a blood parasite transmitted by ticks. The immunization that the cattle received against Texas fever was not sufficient to protect them also against this other disease. Foot-and-mouth disease has also been quite prevalent at different times in Brazil. The imported cattle seem to have regained their vigor and are now in thriving condition. Some of the cattle on this ranch are shown in Plate LIV, figure 2.

There is no Federal meat inspection in Brazil, and no fresh meat is exported. The more important cities, however, have municipal abattoirs with inspection. At these abattoirs the owners of live stock are required to pay fees for slaughter and inspection. The municipality owns the abattoir and employs the butchers and inspectors. Rio de Janeiro has a fine municipal abattoir, recently completed, at which all of the slaughtering for the city is done.

Incidentally, there was seen at São Paulo the Government institute where snake venom is prepared for the treatment of persons bitten by venomous snakes.

PARAGUAY.

Paraguay exports no cattle or fresh meats. It has several "saladeros" (salting establishments producing "tasajo" or "jerked beef") and one extract and canning establishment. There is a good prospect of its becoming a cattle country for the grosser breeds of cattle.

STEAMSHIP TRANSPORTATION TO SOUTH AMERICA.

There is but one steamship company plying between Argentina and New York, namely, the Lamport & Holt Line, which at present has five vessels with a biweekly service. Two of these vessels are now equipped with refrigerator beef boxes, and it is understood that some of the others are to be likewise equipped. It was also said that this line would shortly acquire three vessels from the Nelson Line which are already equipped with refrigerators and which have been plying between South America and England.

Since many of the trans-Atlantic steamers are already equipped with refrigerator boxes, it would be very easy to supply United States markets with South American meats by transshipment by way of England, although this would probably call for a somewhat higher rate than direct shipments to the United States.

During 1912–13, according to the report of the Argentine Commission to the International Refrigeration Congress, there were 91 steamships equipped with refrigerating facilities and engaged in transporting chilled and frozen meat from Argentina to England. These ships have a storage capacity approximating 20,000,000 cubic feet, which is equivalent to space for between 300,000,000 and 400,000,000 pounds of meat.

Freight on the refrigerator steamers from Argentina to England is about 1 cent a pound.

THE SUPPLY OF CATTLE AND SHEEP IN SOUTH AMERICA.

The latest authentic statistics of the number of cattle and sheep in the principal stock-raising countries of South America are as follows:

Country.	Cattle.	Sheep.
Argentina (1908 census)	29,116,625	67,211,754
Argentina (1912)	29,016,000	[1] 80,401,486
Uruguay (1908 census)	8,192,602	26,286,296
Brazil (estimated)	25,000,000	....
Paraguay (estimated)	5,500,000	214,000

[1] The estimate for sheep is for 1911.

For comparison the number of cattle and sheep in certain other countries of the world is given below:

Country.	Cattle.	Sheep.
North America:		
United States (1913)	58,386,000	51,873,000
Canada (1912)	7,103,702	2,393,950
Mexico (1902)	5,142,457	3,424,430
Europe:		
United Kingdom (1912)	11,909,469	28,951,469
France (1911)	14,552,430	16,425,330
Germany (1912)	20,158,738	5,787,848
Australasia:		
Australia (1911)	11,358,977	92,897,368
New Zealand (1911)	2,020,171	23,996,126

The proportion of cattle to population in various countries is shown in the following table:

Proportion of cattle to population and estimated surplus in principal coun ries.

Country.	Population.	Cattle per head of population.	Approximate annual surplus (+) or deficiency (−)[1].
South America:			
Argentina (1910)	7,123,663	4.04	+4,739,596
Uruguay (1908)	1,094,686	7.48	+1,482,126
Brazil (estimated)	21,580,000	1.16	+1,917,000
Paraguay (estimated)	800,000	6.87	+ 985,700
North America:			
United States (1912)	95,410,503	.61	−1,952,872
Canada (1911)	7,204,772	.99	+ 392,487
Mexico (1910)	15,063,207	.34	− 477,830
Europe:			
United Kingdom (1911)	45,365,599	.26	−4,098,906
France (1911)	39,601,509	.37	−1,049,665
Germany (1910)	64,925,993	.31	−2,460,851
Australasia:			
Australia (1911)	4,918,707	2.31	+1,569,123
New Zealand (1911)	1,021,066	1.97	+ 112,300

[1] This column is calculated on the basis of an annual increase of 20 per cent on the total cattle in each country, and on an annual allowance for home consumption of one-seventh of an animal per capita for all countries except Mexico, France, and Germany, for which the allowance is reduced to one-tenth.

THE FUTURE SUPPLY IN SOUTH AMERICA.

During the early part of the year there was considerable discussion in Argentina, Uruguay, and Brazil regarding the slaughtering of cows and calves and its effect in decreasing

the number of cattle. Many suggested that the slaughter of cows and calves be prohibited by law in order that the number of cattle might be increased. Several statements appeared in the press that Argentina and Uruguay had passed laws prohibiting the slaughter of female cattle. It appears, however, that this was not correct, but the subject was considered by the legislature of Argentina, and a committee was appointed by the Rural Society to investigate the matter. This committee reported that the increase in price which stock raisers were receiving for their cattle had produced the effect of stopping the slaughter of female cattle. On account of this increase in the price of cattle many are now converting the grain lands into alfalfa pasture lands as a means for increasing the number of cattle. No action was taken by the legislature, as it was believed that trade conditions would regulate the matter.

The export duty on live cattle from Uruguay was increased so as to avoid any depletion of the herds of that country.

In the State of São Paulo, Brazil, the legislature passed a law placing an export tax upon female cattle shipped out of that State, but providing that when such cattle were replaced by pure-bred cattle the tax was very much less.

While statistics show that Argentina is already slaughtering up to the limit of its present stock of cattle, that country has such great resources for cattle raising that it is easily possible for the stock raisers to bring about a large increase in the meat output if present prices are maintained, which, with the opening of the United States market, seems very probable.

The absence of American banks in these South American countries, and the lack of an American line of steamers, are handicaps to commerce between the United States and South America. The establishment of such banking and transportation facilities would probably be strong factors in promoting closer trade relations.

The author wishes to acknowledge the courtesy and assistance received from Hon. John W. Garrett, minister to Argentina, and Mr. Bartleman, Dr. Goding, and Mr. Lay, consular officers of the United States stationed, respectively, at Buenos Aires, Montevideo, and Rio de Janeiro.

APPENDIX.

AGRICULTURAL COLLEGES IN THE UNITED STATES.[1]

College instruction in agriculture is given in the colleges and universities recei the benefits of the acts of Congress of July 2, 1862, August 30, 1890, and Marc 1907, which are now in operation in all the States and Territories except Ala The total number of these institutions is 68, of which 65 maintain courses of inst tion in agriculture. In 23 States the agricultural colleges are departments of State universities. In 16 States and Territories separate institutions having cou in agriculture are maintained for the colored race. All of the agricultural coll for white persons and several of those for negroes offer four-year courses in agricul and its related sciences leading to bachelors' degrees, and many provide for grad study. About 60 of these institutions also provide special, short, or corresponde courses in the different branches of agriculture, including agronomy, horticult animal husbandry, poultry raising, cheese making, dairying, sugar making, r engineering, farm mechanics, and other technical subjects. Officers of the a cultural colleges engage quite largely in conducting farmers' institutes and var other forms of college extension. The agricultural experiment stations, with few exceptions, are departments of the agricultural colleges. The total numbe persons engaged in the work of education and research in the land-grant colleges the experiment stations in 1913 was 7,651, the number of students (white) in inte courses in the colleges of agriculture and mechanic arts, 47,216; the total numbe students in the whole institutions, 88,408;[2] the number of students (white) in four-year college courses in agriculture, 12,462; the total number of students in institutions for negroes, 8,561, of whom 1,795 were enrolled in agricultural cou With a few exceptions, each of these colleges offers free tuition to residents of State in which it is located. In the excepted cases scholarships are open to pron and energetic students, and in all opportunities are found for some to earn pa their expenses by their own labor. The expenses are from $125 to $300 for the sc year.

Agricultural colleges in the United States.

State or Territory.	Name of institution.	Location.	President.
Alabama	Alabama Polytechnic Institute	Auburn	C. C. Thach.
	Agricultural School of the Tuskegee Normal and Industrial Institute.	Tuskegee Institute	B. T. Washingt
	Agricultural and Mechanical College for Negroes.	Normal	W. S. Buchana
Arizona	University of Arizona	Tucson	Arthur H. Wild
Arkansas	College of Agriculture of the University of Arkansas.	Fayetteville	Martin Nelson.[3]
	Branch Normal College	Pine Bluff	F. T. Venegar.
California	College of Agriculture of the University of California.	Berkeley	T. F. Hunt.[3]
Colorado	The State Agricultural College of Colorado.	Fort Collins	C. A. Lory.
Connecticut	Connecticut Agricultural College	Storrs	C. L. Beach.
Delaware	Delaware College	Newark	G. A. Harter.
	State College for Colored Students	Dover	W. C. Jason.
Florida	College of Agriculture of the University of Florida.	Gainesville	J. J. Vernon.[3]
	Florida Agricultural and Mechanical College for Negroes.	Tallahassee	N. B. Young.
Georgia	Georgia State College of Agriculture	Athens	A. M. Soule.
	Georgia State Industrial College	Savannah	R. R. Wright.
Hawaii	College of Hawaii	Honolulu	J. S. Donaghho.

[1] Including only institutions established under the land-grant act of July 2, 1862.
[2] Not including students in correspondence courses and extension schools.
[3] Dean.
[4] Acting president.

Agricultural colleges in the United States—Continued.

State or Territory.	Name of institution.	Location.	President.
Idaho	College of Agriculture of the University of Idaho.	Moscow	W. L. Carlyle.[1]
Illinois	College of Agriculture of the University of Illinois.	Urbana	E. Davenport.[1]
Indiana	School of Agriculture of Purdue University.	La Fayette	J. H. Skinner.[1]
Iowa	Iowa State College of Agriculture and Mechanic Arts.	Ames	R. A. Pearson.
Kansas	Kansas State Agricultural College	Manhattan	H. J. Waters.
Kentucky	The College of Agriculture of the State University.	Lexington	J. H. Kastle.[1]
	The Kentucky Normal and Industrial Institute for Colored Persons.	Frankfort	G. P. Russell.
Louisiana	Louisiana State University and Agricultural and Mechanical College.	Baton Rouge	T. D. Boyd.
	Southern University and Agricultural and Mechanical College of the State of Louisiana.	Scotland Heights, Baton Rouge.	J. S. Clark.
Maine	College of Agriculture of the University of Maine.	Orono	R. J. Aley.
Maryland	Maryland Agricultural College	College Park	H. J. Patterson.
	Princess Anne Academy, Eastern Branch of the Maryland Agricultural College.	Princess Anne	T. H. Kiah.
Massachusetts	Massachusetts Agricultural College	Amherst	K. L. Butterfield.
	Massachusetts Institute of Technology.[2]	Boston	R. C. Maclaurin.
Michigan	Michigan Agricultural College	East Lansing	J. L. Snyder.
Minnesota	College of Agriculture of the University of Minnesota.	University Farm, St. Paul.	A. F. Woods.[1]
Mississippi	Mississippi Agricultural and Mechanical College.	Agricultural College	G. R. Hightower.
	Alcorn Agricultural and Mechanical College.	Alcorn	J. A. Martin.
Missouri	College of Agriculture of the University of Missouri.	Columbia	F. B. Mumford.[1]
	School of Mines and Metallurgy of the University of Missouri.[2]	Rolla	L. E. Young.[3]
	Lincoln Institute	Jefferson City	B. F. Allen.
Montana	Montana State College of Agriculture and Mechanic Arts.	Bozeman	Jas. M. Hamilton.
Nebraska	College of Agriculture of the University of Nebraska.	Lincoln	E. A. Burnett.[1]
Nevada	College of Agriculture of the University of Nevada.	Reno	J. E. Stubbs.
New Hampshire	New Hampshire College of Agriculture and the Mechanic Arts.	Durham	E. T. Fairchild.
New Jersey	Rutgers Scientific School (the New Jersey State College for the Benefit of Agriculture and the Mechanic Arts).	New Brunswick	W. H. S. Demarest.
New Mexico	New Mexico College of Agriculture and Mechanic Arts.	State College	George E. Ladd.
New York	New York State College of Agriculture.	Ithaca	W. A. Stocking, jr.[4]
North Carolina	The North Carolina College of Agriculture and Mechanic Arts.	West Raleigh	D. H. Hill.
	The Agricultural and Mechanical College for the Colored Race.	Greensboro	J. B. Dudley.
North Dakota	North Dakota Agricultural College	Agricultural College	J. H. Worst.
Ohio	College of Agriculture of Ohio State University.	Columbus	H. C. Price.[1]
Oklahoma	Oklahoma Agricultural and Mechanical College.	Stillwater	J. H. Connell.
	Agricultural and Normal University.	Langston	I. E. Page.
Oregon	Oregon State Agricultural College	Corvallis	W. J. Kerr.
Pennsylvania	The Pennsylvania State College	State College	Edwin E. Sparks.
Porto Rico	College of Agriculture of the University of Porto Rico.	Mayaguez	R. I. Smith.[4]
Rhode Island	Rhode Island State College	Kingston	Howard Edwards.
South Carolina	The Clemson Agricultural College of South Carolina.	Clemson College	W. M. Riggs.
	The Colored Normal, Industrial, Agricultural, and Mechanical College of South Carolina.	Orangeburg	R. S. Wilkinson.
South Dakota	South Dakota State College of Agriculture and Mechanic Arts.	Brookings	G. L. Brown.[5]
Tennessee	College of Agriculture, University of Tennessee.	Knoxville	Brown Ayres.

[1] Dean. [2] Does not maintain courses in agriculture. [3] Director. [4] Acting dean. [5] Acting president.

Agricultural colleges in the United States—Continued.

State or Territory.	Name of institution.	Location.	President.
Texas	Agricultural and Mechanical College of Texas.	College Station	Charles Puryear.[1]
	Prairie View State Normal and Industrial College.	Prairie View	E. L. Blackshear.
Utah	The Agricultural College of Utah	Logan	J. A. Widtsoe.
Vermont	College of Agriculture of the University of Vermont.	Burlington	J. L. Hills.[2]
Virginia	The Virginia Agricultural and Mechanical College and Polytechnic Institute.	Blacksburg	J. D. Eggleston.
	The Hampton Normal and Agricultural Institute.	Hampton	H. B. Frissell.
Washington	State College of Washington	Pullman	E. A. Bryan.
West Virginia	College of Agriculture of West Virginia University.	Morgantown	E. D. Sanderson.[2]
	The West Virginia Colored Institute.	Institute	Byrd Prillerman.
Wisconsin	College of Agriculture of the University of Wisconsin.	Madison	H. L. Russell.[2]
Wyoming	College of Agriculture, University of Wyoming.	Laramie	C. A. Duniway.

[1] Acting president. [2] Dean.

AGRICULTURAL EXPERIMENT STATIONS OF THE UNITED STATES, THEIR LOCATIONS AND DIRECTORS.

Alabama (College), Auburn: J. F. Duggar.
Alabama (Canebrake), Uniontown: L. H. Moore.
Alabama (Tuskegee), Tuskegee Institute: G. W. Carver.
Alaska, Sitka (Rampart, Kodiak, and Fairbanks): C. C. Georgeson.[3]
Arizona, Tucson: R. H. Forbes.
Arkansas, Fayetteville: Martin Nelson.
California, Berkeley: T. F. Hunt.
Colorado, Fort Collins: C. P. Gillette.
Connecticut (State), New Haven } E. H. Jenkins.
Connecticut (Storrs), Storrs } E. H. Jenkins.
Delaware, Newark: Harry Hayward.
Florida, Gainesville: P. H. Rolfs.
Georgia, Experiment: R. J. H. DeLoach.
Guam:[2] J. B. Thompson.[1]
Hawaii (Federal), Honolulu: E. V. Wilcox.[1]
Hawaii (Sugar Planters'), Honolulu: H. P. Agee.
Idaho, Moscow: W. L. Carlyle.
Illinois, Urbana: E. Davenport.
Indiana, La Fayette: Arthur Goss.
Iowa, Ames: C. F. Curtiss.
Kansas, Manhattan: W. M. Jardine.
Kentucky, Lexington: J. H. Kastle.
Louisiana (Sugar), New Orleans } W. R. Dodson.
Louisiana (State), Baton Rouge } W. R. Dodson.
Louisiana (North), Calhoun } W. R. Dodson.
Louisiana (Rice), Crowley } W. R. Dodson.
Maine, Orono: C. D. Woods.
Maryland, College Park: H. J. Patterson.
Massachusetts, Amherst: W. P. Brooks.
Michigan, East Lansing: R. S. Shaw.
Minnesota, University Farm, St. Paul: A. F. Woods.
Mississippi, Agricultural College: E. R. Lloyd.
Missouri (College), Columbia: F. B. Mumford.
Missouri (Fruit), Mountain Grove: Paul Evans.
Montana, Bozeman: F. B. Linfield.
Nebraska, Lincoln: E. A. Burnett.
Nevada, Reno: S. B. Doten.
New Hampshire, Durham: J. C. Kendall.
New Jersey (State), New Brunswick } J. G. Lipman.
New Jersey (College), New Brunswick } J. G. Lipman.
New Mexico, State College: Fabian Garcia.
New York (State), Geneva: W. H. Jordan.
New York (Cornell), Ithaca: W. A. Stocking, jr.[3]
North Carolina (College), West Raleigh } B. W. Kilgore.
North Carolina (State), Raleigh } B. W. Kilgore.
North Dakota, Agricultural College: T. P. Cooper.
Ohio, Wooster: C. E. Thorne.
Oklahoma, Stillwater: L. L. Lewis.[3]
Oregon, Corvallis: ———.
Pennsylvania, State College: R. L. Watts.
Pennsylvania (Institute of Animal Nutrition), State College: H. P. Armsby.
Porto Rico (Federal), Mayaguez: D. W. May.[1]
Porto Rico (Sugar), Rio Piedras: J. T. Crawley.
Rhode Island, Kingston: B. L. Hartwell.
South Carolina, Clemson College: J. N. Harper.
South Dakota, Brookings: J. W. Wilson.
Tennessee, Knoxville: H. A. Morgan.
Texas, College Station: B. Youngblood.
Utah, Logan: E. D. Ball.
Vermont, Burlington: J. L. Hills.
Virginia (College), Blacksburg: S. W. Fletcher.
Virginia (Truck), Norfolk: T. C. Johnson.
Washington, Pullman: I. D. Cardiff.
West Virginia, Morgantown: E. D. Sanderson.
Wisconsin, Madison: H. L. Russell.
Wyoming, Laramie: H. G. Knight.

[1] Special agent in charge. [2] Address: Island of Guam, via San Francisco. [3] Acting director.

STATE OFFICIALS IN CHARGE OF AGRICULTURE.

Alabama: Commissioner of Agriculture, Montgomery.
Alaska: Special Agent in Charge of Experiment Stations, Sitka.
Arizona: Director of Experiment Station, Tucson.
Arkansas: Commissioner of Agriculture, Little Rock.
California: Secretary of State Board of Agriculture, Sacramento.
Colorado: Secretary of State Board of Agriculture, Fort Collins.
Connecticut: Secretary of State Board of Agriculture, Hartford.
Delaware: Secretary of State Board of Agriculture, Dover.
Florida: Commissioner of Agriculture, Tallahassee.
Georgia: Commissioner of Agriculture, Atlanta.
Hawaii: Secretary of Territorial Board of Agriculture, Honolulu.
Idaho: Commissioner of Immigration, Labor, and Statistics, Boise.
Illinois: Secretary of State Board of Agriculture, Springfield.
Indiana: Secretary of State Board of Agriculture, Indianapolis.
Iowa: Secretary of State Board of Agriculture, Des Moines.
Kansas: Secretary of State Board of Agriculture, Topeka.
Kentucky: Commissioner of Agriculture, Frankfort.
Louisiana: Commissioner of Agriculture, Baton Rouge.
Maine: Commissioner of Agriculture, Augusta.
Maryland: Director of Experiment Station, College Park.
Massachusetts: Secretary of State Board of Agriculture, Boston.
Michigan: Secretary of State Board of Agriculture, East Lansing.
Minnesota: Secretary of State Agricultural Society, St. Paul.
Mississippi: Commissioner of Agriculture, Jackson.
Missouri: Secretary of State Board of Agriculture, Columbia.
Montana: Commissioner of Agriculture, Helena.
Nebraska: Secretary of State Board of Agriculture, Lincoln.
Nevada: Secretary of State Board of Agriculture, Carson City.
New Hampshire: Secretary of State Board of Agriculture, Concord.
New Jersey: Secretary of State Board of Agriculture, Trenton.
New Mexico: Director of Experiment Station, Agricultural College.
New York: Commissioner of Agriculture, Albany.
North Carolina: Commissioner of Agriculture, Raleigh.
North Dakota: Commissioner of Agriculture, Bismarck.
Ohio: Secretary of State Board of Agriculture, Columbus.
Oklahoma: President of State Board of Agriculture, Oklahoma.
Oregon: Secretary of State Board of Agriculture, Salem.
Pennsylvania: Secretary of Agriculture, Harrisburg.
Philippine Islands: Director of Agriculture, Manila.
Porto Rico: Director of Experiment Station, Mayaguez.
Rhode Island: Secretary of State Board of Agriculture, Providence.
South Carolina: Commissioner of Agriculture, Columbia.
South Dakota: Secretary of State Board of Agriculture, Huron.
Tennessee: Commissioner of Agriculture, Nashville.
Texas: Commissioner of Agriculture, Austin.
Utah: Director of Experiment Station, Logan.
Vermont: Commissioner of Agriculture, Plainfield.
Virginia: Commissioner of Agriculture, Richmond.
Washington: Director of Experiment Station, Pullman.
West Virginia: Secretary of State Board of Agriculture, Charleston
Wisconsin: Secretary of State Board of Agriculture, Madison.
Wyoming: Director of Experiment Station, Laramie.

STATISTICS OF THE PRINCIPAL CROPS.

[Figures furnished by the Bureau of Statistics, Department of Agriculture, except where otherwise stated. All prices on gold basis.]

CORN.

TABLE 1.—*Corn crop of countries named, 1911–1913.*

Country.	Area.			Production.		
	1911	1912	1913	1911	1912	1913
NORTH AMERICA.	*Acres.*	*Acres.*	*Acres.*	*Bushels.*	*Bushels.*	*Bushels.*
United States	105,825,000	107,083,000	105,820,000	2,531,488,000	3,124,746,000	2,446,988,000
Canada:						
Ontario	298,000	279,000	260,000	18,467,000	16,466,000	16,182,000
Quebec	23,000	19,000	18,000	712,000	476,000	586,000
Other	(1)	(1)	(1)	6,000	8,000	5,000
Total Canada	321,000	298,000	278,000	19,185,000	16,950,000	16,773,000
Mexico	[2] 13,375,000	(3)	(3)	190,000,000	190,000,000	190,000,000
Total				2,740,673,000	3,331,696,000	2,653,761,000
SOUTH AMERICA.						
Argentina	7,945,000	8,456,000	9,464,000	27,675,000	295,849,000	196,642,000
Chile	46,000	56,000	(3)	1,221,000	1,527,000	1,200,000
Uruguay	498,000	591 000	( )	3,643,000	8,000,000	4,000,000
Total				32,539,000	305,376,000	201,842,000
EUROPE.						
Austria-Hungary:						
Austria	748,000	752,000	705,000	11,856,000	15,053,000	13,280,000
Hungary proper	6,090,000	6,022,000	6,129,000	137,423,000	176,694,000	182,069,000
Croatia-Slavonia	1,024,000	1,065,000	1,882,000	24,006,000	24,166,000	24,000,000
Bosnia-Herzegovina	510,000	549,000	805,000	8,416,000	8,555,000	7,559,000
Total Austria-Hungary	8,372,000	8,388,000	9,521,000	181,701,000	224,468,000	226,908,000
Bulgaria	1,562,000	(3)	(3)	30,589,000	30,000,000	30,000,000
France	1,049,000	1,177,000	(3)	16,860,000	23,733,000	22,000,000
Italy	4,066,000	3,938,000	3,888,000	93,680,000	98,668,000	108,388,000
Portugal	(3)	(3)	(3)	15,000,000	15,000,000	15,000,000
Roumania	5,153,000	5,138,000	5,305,000	110,712,000	103,921,000	118,104,000
Russia:						
Russia proper	3,177,000	3,393,000	....	67,842,000	62,904,000	....
Northern Caucasia	759,000	662,000	....	14,087,000	16,704,000	....
Total Russia	[4] 3,936,000	4,055,000	[4] 4,233,000	81,929,000	79,608,000	[4] 72,870,000
Servia	1,443,000	1,446,000	1,445 000	26,531,000	22,833,000	23,621,000
Spain	1,445,000	1,149,000	1,105,000	28,730,000	25,069,000	25,140,000
Total				585,732,000	623,300,000	642,031,000
ASIA.						
British India (including native States)	6,312,000	(3)	(3)	(3)	(3)	(3)
Japan	132,000	136,000	(3)	3,550,000	(3)	(3)
Philippine Islands	747,000	840,000	988,000	5,293,000	7,810,000	10,224,000

[1] Less than 500 acres.
[2] Estimate for 1910.
[3] No official statistics.
[4] Includes 10 governments of Asiatic Russia.

CORN—Continued.

TABLE 1.—*Corn crop of countries named, 1911-1913*—Contin

Country.	Area.			Producti	
	1911	1912	1913	1911	1912
AFRICA.	*Acres.*	*Acres.*	*Acres.*	*Bushels.*	*Bushels*
Algeria	39,000	31,000	24,000	554,000	374,0
Egypt	1,840,000	1,903,000	(1)	67,903,000	60,857,0
Union of South Africa	(1)	(1)	(1)	30,830,000	[2] 30,830,0
Total				99,287,000	92,061,0
AUSTRALASIA.					
Australia:					
Queensland	181,000	154,000	118,000	4,601,000	3,752,0
New South Wales	213,000	168,000	176,000	7,833,000	4,649,0
Victoria	20,000	18,000	20,000	1,013,000	818,0
Western Australia			(3)	1,000	
South Australia	1,000	(3)	(1)	7,000	2,0
Total Australia	415,000	340,000	315,000	13,455,000	9,221,0
New Zealand	13,000	6,000	5,000	478,000	278,0
Total Australasia	428,000	346,000	320,000	13,933,000	9,499,0
Grand total				3,481,007,000	4,369,742,0

[1] No official statistics. [2] Census figures of 1911 repeated. [3] Less tha

TABLE 2.—*Total production of corn in countries named in Table 1,*

Year.	Production.	Year.	Production.	Year.	Production.	Year.
	Bushels.		*Bushels.*		*Bushels.*	
1894	1,671,307,000	1899	2,724,100,000	1904	3,109,252,000	1909
1895	2,834,750,000	1900	2,792,561,000	1905	3,461,181,000	1910
1896	2,964,435,000	1901	2,366,883,000	1906	3,963,645,000	1911
1897	2,587,206,000	1902	3,187,311,000	1907	3,420,321,000	1912
1898	2,682,619,000	1903	3,066,506,000	1908	3,606,931,000	1913

CORN—Continued.

TABLE 3.—*Acreage, production, value, and exports of corn, United States, 1849–1913.*

s returns, figures in roman are
ined by applying estimated per
year, except that a revised bas
available.

[1] Contract since 1908. [2] Coincident with "corner." [3] Figures adjusted to census basis.

CORN—Continued.

TABLE 4.—*Acreage production, total value, and value per acre of corn, by States,* 1921.

CORN—Continued.

TABLE 5.—*Yield per acre, and price per bushel of corn, by States.*

Farm price (cents) per bushel.

10-

63 79

58
52
49
46
39

S. Dak...		
Nebr		
Kans.....		
Ky.......		
Tenn.....		
Ala.		
Miss.....		
La.......		
Tex		
Okla		
Ark.....		
Mont ...		
Wyo. ...		
Colo......		
N. Mex...		
Ariz.....		
Utah		
Nev.		
Idaho.....		
Wash....		
Oreg. ...		
Cal.		
U. S.	40.6	34.5

[1] The Territories.

Table 6.—*Wholesale price of corn per bushel, 1899–1913.*

[1] No. 2 grade, 1899 and 1900.
[2] No. 2 grade, 1899 to 1908.
[3] No. 2 grade, 1899 to 1904.
[4] No. 2 mixed
[5] Nominal.

Table 7.—*Condition of corn crop, United States, on first of months named, 1893–1913.*

CORN—Continued.

TABLE 8.—*Farm price of corn per bushel on first of each month, by geographical divisions, 1912 and 1913.*

TABLE 9.—*International trade in corn, including corn meal, calendar years 1910–1912.*

[The item *maicena* or *maizena* is included as "Corn and corn meal."]

GENERAL NOTE. Substantially the international trade of the world. It should not be expected that the world export and import totals for any year will agree. Among sources of disagreement are these: (1) Different periods of time covered in the "year" of the various countries; (2) imports received in year subsequent to year of export; (3) want of uniformity in classification of goods among countries; (4) different practices and varying degrees of failure in recording countries of origin and ultimate destination; (5) different practices of recording reexported goods; (6) opposite methods of treating free ports; (7) clerical errors, which, it may be assumed, are not infrequent.

The exports given are domestic exports, and the imports given are imports for consumption as far as it is feasible and consistent so to express the facts. While there are some inevitable omissions, on the other hand, there are some duplications because of reshipments that do not appear as such in official reports. For the United Kingdom import figures refer to imports for consumption, when available, otherwise total imports less exports of "foreign and colonial merchandise." Figures for the United States include Alaska, Porto Rico, and Hawaii.

EXPORTS

[000 omitted.]

Country.	1910	1911	1912	Country.	1910	1911	1912
	Bush.	*Bush.*	*Bush.*		*Bush.*	*Bush.*	*Bush.*
Argentina	104,727	4,928	190,353	Russia	17,686	52,759	30,265
Austria-Hungary	1,069	156	38	Servia	6,095	4,627	[1] 4,627
Belgium	7,582	8,846	10,909	United States	44,072	63,533	32,649
British South Africa	6,517	3,892	3,756	Uruguay	192	19	20
Bulgaria	4,823	13,980	[1] 13,980	Other countries	5,660	5,076	[2] 5,456
Netherlands	5,101	5,939	13,557				
Roumania	23,419	61,233	[1] 61,233	Total	227,543	224,968	368,923

IMPORTS.

[1] Year preceding. [2] Preliminary.

WHEAT.

TABLE 10.—*Wheat crop of countries named, 1911–1913.*

Country.	Area	Production.
NORTH AMERICA.		
United States.		
Canada:		
New Brunswick		
Ontario		
Manitoba		
Saskatchewan		
Alberta		
Other		
Total Canada		
Mexico		
Total		
SOUTH AMERICA.		
Argentina		
Chile		
Uruguay		
Total		
EUROPE.		
Austria-Hungary:		
Austria		
Hungary proper		
Croatia-Slavonia		
Bosnia-Herzegovina		
Total Austria Hungary		
Belgium		
Bulgaria		
Denmark		
Finland		
France		
Germany		
Greece		
Italy		
Montenegro		
Netherlands		
Norway		
Portugal		
Roumania		
Russia:		
Russia proper		
Poland		
Northern Caucasia		
Total Russi (European)		
Servia		
Spain		
Sweden		
Switzerland		
Turkey (European)		
United Kingdom		
England		
Wales		
Scotland		
Ireland		
Total Unite Kingdom		
Total		

[1] No data. [2] Census of 1907. [3] Includes 10 governments of Asiatic Russia.

WHEAT—Continued.

TABLE 10.—*Wheat crop of countries named, 1911–1913*—Continued.

Country.	Area.			Production.		
	1911	1912	1913	1911	1912	1913
ASIA.						
British India, including such native states as report	*Acres.* 30,565,000	*Acres.* 31,141,000	*Acres.* 29,569,000	*Bushels.* 375,629,000	*Bushels.* 370,515,000	*Bushels.* 358,388,000
Cyprus	(1)	(1)	(1)	2,394,000	2,071,000	2,100,000
Japanese Empire:						
Japan	1,223,000	1,216,000	1,226,000	25,645,000	26,514,000	27,000,000
Formosa	13,000	(1)	(1)	138,000	140,000	140,000
Total Japanese Empire	....	....	....	25,783,000	26,654,000	27,140,000
Persia	(1)	(1)	(1)	16,000,000	16,000,000	16,000,000
Russia:						
Central Asia (4 governments of)	3,616,000	3,804,000	....	19,830,000	36,977,000	....
Siberia (4 governments of)	5,888,000	6,254,000	....	41,783,000	59,198,000	....
Transcaucasia (1 government of)	11,000	10,000	....	102,000	105,000	....
Total Russia (Asiatic)	9,515,000	10,068,000	(2)	61,715,000	96,280,000	(2)
Turkey (Asia Minor only)	(1)	(1)	(1)	35,000,000	35,000,000	35,000,000
Total	....	....	....	516,521,000	546,521,000	438,628,000
AFRICA.						
Algeria	3,554,000	3,614,000	3,448,000	35,874,000	27,172,000	36,848,000
Egypt	1,285,000	1,332,000	1,331,000	38,046,000	30,903,000	30,900,000
Tunis	1,401,000	1,263,000	1,235,000	8,635,000	4,225,000	5,589,000
Union of South Africa	(1)	(1)	(1)	6,034,000	[3] 6,034,000	[3] 6,034,000
Total	....	....	....	88,589,000	68,334,000	79,371,000
AUSTRALASIA.						
Australia:						
Queensland	107,000	43,000	125,000	1,055,000	294,000	2,038,000
New South Wales	2,129,000	2,381,000	2,231,000	28,793,000	25,879,000	33,499,000
Victoria	2,398,000	2,164,000	2,085,000	35,910,000	21,550,000	27,050,000
South Australia	2,105,000	2,191,000	2,080,000	25,112,000	20,994,000	22,174,000
Western Australia	582,000	612,000	793,000	6,083,000	4,496,000	9,457,000
Tasmania	52,000	37,000	25,000	1,156,000	681,000	650,000
Total Australia	7,373,000	7,428,000	7,339,000	98,109,000	73,894,000	94,868,000
New Zealand	322,000	215,000	190,000	8,535,000	8,000,000	5,886,000
Total Australasia	7,695,000	7,643,000	7,529,000	106,644,000	81,894,000	100,754,000
Grand total	....	....	....	3,551,795,000	3,791,875,000	4,124,900,000

[1] No data. [2] Included under total Russia (European). [3] Census figures of 1911 repeated.

NOTE.—The above figures for European and Asiatic Russia include 72 governments only; the area and production in the whole Empire in 1911 were 80,086,000 acres and 563,485,000 bushels.

WHEAT—Continued.

TABLE 11.—*Total production of wheat in countries named in Table 10, 1891-1913.*

Year.	Production.	Year.	Production.	Year.	Production.	Year.	Production.
	Bushels.		*Bushels.*		*Bushels.*		*Bushels.*
1891	2,432,322,000	1897	2,236,268,000	1903	3,189,813,000	1909	3,581,519,000
1892	2,481,805,000	1898	2,948,305,000	1904	3,163,542,000	1910	3,575,055,000
1893	2,559,174,000	1899	2,783,885,000	1905	3,327,084,000	1911	3,551,795,000
1894	2,660,557,000	1900	2,640,751,000	1906	3,434,354,000	1912	3,791,875,000
1895	2,593,312,000	1901	2,955,975,000	1907	3,133,965,000	1913	4,124,900,000
1896	2,506,320,000	1902	3,090,116,000	1908	3,182,105,000		

TABLE 12.—*Average yield of wheat in countries named, bushels per acre, 1890-1913.*

Year.	United States.	Russia (European).[1]	Germany.[1]	Austria.[1]	Hungary proper.[1]	France.[2]	United Kingdom.[2]
Average:							
1890-1899	13.2	8.9	24.5	16.2	....	18.6	31.2
1900-1909	14.1	9.7	28.9	18.0	17.5	20.5	33.1
1904	12.5	11.5	29.5	19.5	16.3	18.5	27.8
1905	14.5	10.0	28.5	19.6	18.7	20.9	33.9
1906	15.5	7.7	30.3	20.3	22.5	20.2	34.8
1907	14.0	8.0	29.6	18.0	14.9	23.2	35.1
1908	14.0	8.8	29.7	21.0	17.5	19.6	33.4
1909	15.4	12.5	30.5	19.9	14.1	22.0	35.0
1910	13.9	11.2	29.6	19.2	19.8	15.9	31.4
1911	12.5	7.0	30.6	19.6	20.9	19.8	34.0
1912	15.9	10.3	33.6	22.3	19.8	21.0	30.0
1913	15.2	[3] 12.9	35.1	19.9	19.2	19.9	32.6
Average (1904-1913)	14.3	10.0	30.7	19.9	18.4	20.1	32.8

[1] Bushels of 60 pounds. [2] Winchester bushels. [3] Includes 10 governments of Asiatic Russia.

WHEAT—Continued.

TABLE 13.—*Acreage, production, value, and exports of wheat in the United States, 1849–1913.*

NOTE.—Figures in *italics* are census returns; figures in roman are estimates of the Department of Agriculture. Estimates of acres are obtained by applying estimated percentages of increase or decrease to the published numbers of the preceding year, except that a revised base is used for applying percentage estimates whenever new census data are available.

[1] No. 2, red winter.

[2] Figures adjusted to census basis

TABLE 14.—*Acreag* *1 of winter and spring wheat,*

[1] Census acreage and production.

WHEAT—Continued.

Table 15.—*Acreage, production, total farm value, and value per acre of wheat, by States, 1912 and 1913.*

State.	Thousands of acres.		Production (thousands of bushels).		Total value, basis Dec. 1 price (thousands of dollars).		Value (dollars) per acre, basis Dec. 1 price.	
	1913	1912	1913	1912	1913	1912	1913	1912
Maine	3	3	76	70	77	72	25.76	24.20
Vermont	1	1	24	25	24	24	24.50	24.50
New York	340	335	6,800	5,360	6,324	5,306	18.60	15.84
New Jersey	80	79	1,408	1,462	1,352	1,433	16.90	18.13
Pennsylvania	1,286	1,240	21,862	22,320	19,894	21,204	15.47	17.10
Delaware	113	111	1,638	1,942	1,441	1,864	12.76	16.80
Maryland	610	599	8,113	8,985	7,221	8,536	11.84	14.25
Virginia	780	741	10,608	8,596	10,184	8,682	13.06	11.72
West Virginia	235	233	3,055	3,378	3,055	3,412	13.00	14.64
North Carolina	605	598	7,078	5,322	7,503	5,907	12.40	9.88
South Carolina	79	79	972	727	1,264	865	15.99	10.95
Georgia	140	132	1,708	1,228	2,050	1,498	14.64	11.35
Ohio	1,950	1,220	35,100	9,760	31,590	9,565	16.20	7.84
Indiana	2,150	1,260	39,775	10,080	35,002	9,374	16.28	7.44
Illinois	2,240	1,183	41,888	9,819	36,024	8,641	16.08	7.30
Michigan	835	700	12,776	7,000	11,371	6,720	13.62	9.60
Wisconsin	190	188	3,665	3,564	3,005	2,958	15.83	15.77
Minnesota	4,200	4,325	68,040	67,038	51,711	48,938	12.31	11.32
Iowa	795	650	16,395	12,850	12,460	10,023	15.66	15.44
Missouri	2,315	1,900	39,586	23,750	33,252	21,375	14.36	11.25
North Dakota	7,510	7,990	78,855	143,820	57,564	99,236	7.66	12.42
South Dakota	3,775	3,675	33,975	52,185	24,122	36,008	6.39	9.80
Nebraska	3,475	3,123	62,325	55,052	44,251	37,985	12.71	12.14
Kansas	6,710	5,956	86,983	92,290	68,717	68,295	11.27	11.47
Kentucky	725	686	9,860	6,860	9,466	6,791	13.06	9.90
Tennessee	700	674	8,400	7,077	8,232	7,077	11.76	10.50
Alabama	32	30	374	318	430	359	13.46	11.98
Mississippi	1	8	14	96	13	93	13.30	11.64
Texas	780	735	13,650	11,025	12,831	10,253	16.45	13.95
Oklahoma	1,750	1,570	17,500	20,096	14,350	15,072	8.20	9.60
Arkansas	101	94	1,313	940	1,182	884	11.70	9.40
Montana	870	803	20,673	19,346	13,644	12,381	15.71	15.42
Wyoming	90	76	2,250	2,181	1,620	1,745	18.00	22.96
Colorado	460	453	9,680	10,968	7,551	8,006	16.38	17.67
New Mexico	65	59	1,221	1,232	1,184	1,109	18.24	18.81
Arizona	29	23	928	707	1,021	778	35.20	33.77
Utah	265	236	6,420	6,059	4,687	4,544	17.67	19.28
Nevada	39	39	1,081	1,137	887	1,137	22.71	29.20
Idaho	510	510	14,094	14,566	8,879	9,613	17.39	18.88
Washington	2,300	2,285	53,300	53,728	38,909	36,535	16.94	15.98
Oregon	750	842	15,717	21,018	11,788	15,132	15.75	18.00
California	300	370	4,200	6,290	3,990	5,850	13.30	15.81
United States	50,184	45,814	763,380	730,267	610,122	555,280	12.16	12.12

WHEAT—Continued.

Table 16.—*Yield per acre and price per bushel of wheat, by States.*

WHEAT—Continued.

Table 17.—*Condition of wheat crop on first of months named, and yield per acre, United States, 1890–1914.*

Year.	Winter wheat.						Spring wheat.				
	December of previous year.	April.	May.	June.	When harvested.	Yield per acre.	June.	July.	August.	When harvested.	Yield per acre.
	P. ct.	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*	*Bu.*	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*	*Bu.*
1890	95.3	81.0	80.0	78.1	76.2	10.9	91.3	94.4	83.2	79.7	11.4
1891	98.4	96.9	97.9	96.6	96.2	14.7	92.6	94.1	95.5	97.2	16.7
1892	85.3	81.2	84.0	88.3	89.6	13.7	92.3	90.9	87.3	81.2	12.7
1893	87.4	77.4	75.4	75.5	77.7	12.0	86.4	74.1	67.0	68.9	10.2
1894	91.5	86.7	81.4	83.2	83.9	14.0	88.0	68.4	67.1	69.9	11.5
1895	89.0	81.4	82.9	71.1	65.8	11.6	97.8	102.2	95.9	94.9	18.0
1896	81.4	77.1	82.7	77.9	75.6	11.8	99.9	93.3	78.9	73.8	13.5
1897	99.5	81.4	80.2	78.5	81.2	14.1	89.6	91.2	86.7	80.8	12.5
1898	......	86.7	86.5	90.8	85.7	14.9	100.9	95.0	96.5	91.7	16.0
1899	92.6	77.9	76.2	67.3	65.6	11.5	91.4	91.7	83.6	77.2	13.3
1900	97.1	82.1	88.9	82.7	80.8	13.3	87.3	55.2	56.4	56.1	10.6
1901	97.1	91.7	94.1	87.8	88.3	15.2	92.0	95.6	80.3	78.4	14.7
1902	86.7	78.7	76.4	76.1	77.0	14.4	95.4	92.4	89.7	87.2	14.7
1903	99.7	97.3	92.6	82.2	78.8	12.3	95.9	82.5	77.1	78.1	14.0
1904	86.6	76.5	76.5	77.7	78.7	12.4	93.4	93.7	87.5	66.2	12.8
1905	82.9	91.6	92.5	85.5	82.7	14.3	93.7	91.0	89.2	87.3	14.7
1906	94.1	89.1	90.9	82.7	85.6	16.7	93.4	91.4	86.9	83.4	13.7
1907	94.1	89.9	82.9	77.4	78.3	14.6	88.7	87.2	79.4	77.1	13.2
1908	91.1	91.3	89.0	86.0	80.6	14.4	95.0	89.4	80.7	77.6	13.2
1909	85.3	82.2	83.5	80.7	82.4	15.8	95.2	92.7	91.6	88.6	15.8
1910	95.8	80.8	82.1	80.0	81.5	15.9	92.8	61.6	61.0	63.1	11.0
1911	82.5	83.3	86.1	80.4	76.8	14.8	94.6	73.8	59.8	56.7	9.4
1912	86.6	80.6	79.7	74.3	73.3	15.1	95.8	89.3	90.4	90.8	17.2
1913	93.2	91.6	91.9	83.5	81.6	16.5	93.5	73.8	74.1	75.3	13.0
1914	97.2	95.6	......	......	......	......	......	......	......	......	......

Table 18.—*Per cent of winter wheat area sown which was abandoned (not harvested).*

Year.	Per cent.	Year.	Per cent.	Year.	Per cent.
1899	13.5	1904	15.4	1909	7.5
1900	11.8	1905	4.6	1910	13.7
1901	6.7	1906	5.5	1911	10.7
1902	15.2	1907	11.2	1912	20.1
1903	2.8	1908	4.2	1913	4.5

WHEAT—Continued.

TABLE 19.—*Farm price of wheat per bushel, on first of each month, by geographic divisions, 1912 and 1913.*

TABLE 20.—*Wholesale price of wheat per bushel, 1899–1913.*

[1] No grade, 1899 to 1901.

[2] No. 2 northern, 1899 and 1900.

WHEAT—Continued.

TABLE 21.—*Wholesale price of wheat flour per barrel, 1899–1913.*

Date.	Chicago.				Cincinnati.		New York.		St. Louis.	
	Winter patents.		Spring patents.		Winter family.		Spring patents.		Winter patents.	
	Low.	High.	Low.	High.	Low.	High.	Low.	High.	Low.	High.
1899	$3.40	$4.00	$3.20	$3.90	$2.35	$2.75	$3.40	$4.25	$3.35	$4.00
1900	3.40	4.40	3.00	4.30	2.35	3.50	3.25	5.00	3.35	4.25
1901	3.30	3.90	3.25	3.80	2.20	3.25	3.30	4.25	3.30	4.10
1902	3.40	4.00	3.20	3.90	2.70	3.35	3.50	4.25	3.10	4.25
1903	3.40	4.20	3.30	4.60	2.65	3.55	3.55	5.00	3.35	4.40
1904	4.00	5.50	4.00	6.00	3.25	4.70	4.30	6.60	4.25	5.75
1905	3.85	5.20	3.75	5.70	3.10	4.70	4.25	6.35	4.05	5.60
1906	3.20	4.10	3.55	4.15	2.70	3.60	3.75	4.80	3.35	4.60
1907	3.10	5.10	2.70	5.75	2.70	4.30	3.80	6.00	3.50	5.00
1908	4.00	5.10	4.90	5.75	3.25	4.10	4.85	5.90	4.35	5.10
1909	4.65	6.75	5.35	7.00	3.95	5.85	4.80	6.85	4.60	7.00
1910	4.00	5.80	6.00	7.00	3.10	5.10	4.80	6.35	4.35	6.20
1911	3.60	5.40	5.10	6.55	2.60	3.70	4.45	5.75	3.90	5.25
1912	3.75	5.45	4.00	5.60	3.40	4.50	4.25	6.00	4.20	5.85
1913.										
January	4.75	4.90	4.10	5.10	4.00	4.15	4.50	4.75	4.65	5.15
February	4.60	5.10	4.25	5.10	3.75	4.15	4.45	4.70	4.60	5.15
March	4.45	4.80	4.10	5.10	3.60	4.00	4.40	4.70	4.30	5.00
April	4.50	4.75	4.10	5.30	3.60	3.85	4.55	4.90	4.40	4.80
May	4.45	4.65	4.25	5.50	3.25	3.85	4.70	5.00	4.35	4.75
June	4.30	4.65	4.30	5.60	3.25	3.50	4.70	5.00	4.30	4.60
July	3.90	4.35	4.30	5.50	3.20	3.50	4.65	5.00	3.75	4.55
August	3.90	4.10	4.15	5.40	2.90	3.50	4.65	4.85	3.70	4.00
September	3.90	4.25	4.30	5.30	2.90	3.25	4.50	4.85	3.85	4.10
October	4.10	4.25	4.00	5.30	2.90	3.50	4.40	4.65	3.80	4.10
November	4.15	4.30	4.00	5.15	3.20	3.50	4.45	4.65	4.00	4.15
December	4.15	4.30	4.00	5.15	3.20	3.50	4.40	4.65	4.00	4.20
Year	3.90	4.90	4.00	5.60	2.90	4.15	4.40	5.00	3.70	5.15

TABLE 22.—*International trade in wheat and wheat flour, calendar years 1910–1912.*

["Temporary" imports into Italy of wheat, to be used for manufacturing products for export, are subtracted from the total imports as given in the official Italian returns. In the trade returns of Chile the item *trigo mote* (prepared corn) which might easily be confused with *trigo* (wheat) is omitted. See "General note," p. 375.]

EXPORTS.

[000 omitted.]

Country.	Wheat.			Wheat flour.			Wheat and wheat flour.[1]		
	1910	1911	1912	1910	1911	1912	1910	1911	1912
	Bushels.	*Bushels.*	*Bushels.*	*Barrels.*	*Barrels.*	*Barrels.*	*Bushels.*	*Bushels.*	*Bushels.*
Argentina	69,209	83,993	96,600	1,298	1,333	1,480	75,051	89,991	103,260
Australia	47,762	55,148	32,604	1,428	1,816	1,739	54,188	63,319	40,428
Austria-Hungary	28	15	56	146	122	167	684	566	806
Belgium	22,898	22,723	16,576	718	750	732	26,129	26,099	19,870
British India	40,481	52,557	65,598	449	581	714	42,499	55,171	68,812
Bulgaria	8,688	11,122	[2] 11,122	581	756	[2] 756	11,304	14,524	[2] 14,524
Canada	46,426	60,474	84,958	3,189	3,542	4,303	60,777	76,414	104,320
Chile	2,247	509	2,411	129	69	74	2,826	821	2,743
Germany	10,339	11,390	11,853	2,137	1,820	1,924	19,957	19,581	20,510
Netherlands	58,300	46,171	51,444	267	191	157	59,504	47,028	52,152
Roumania	67,659	53,586	[2] 53,586	455	730	730	69,708	56,872	[2] 56,872
Russia	225,458	144,779	96,868	1,257	1,355	807	231,113	150,875	100,498
Servia	2,669	3,366	[2] 3,366	114	80	[2] 80	3,181	3,727	[2] 3,727
United States	24,257	32,669	61,655	8,370	11,258	10,622	61,923	83,330	109,451
Other countries	15,942	18,815	[3] 13,251	2,899	2,945	[3] 3,199	28,984	32,065	[3] 27,653
Total	642,363	597,317	601,948	23,437	27,348	27,484	747,828	720,383	725,626

[1] Flour is reduced to terms of grain, where included in these 3 columns, by assuming 1 barrel of flour to be the product of 4½ bushels of wheat.
[2] Year preceding.
[3] Preliminary.

WHEAT—Continued.

TABLE 22.—*International trade in wheat and wheat flour, calendar years 1910–191*—Continued.

IMPORTS.

[000 omitted.]

Country.	Wheat.			Wheat flour.			Wheat and wheat flo		
	1910	1911	1912	1910	1911	1912	1910	1911	19
	Bushels.	*Bushels.*	*Bushels.*	*Barrels.*	*Barrels.*	*Barrels.*	*Bushels.*	*Bushels.*	*Bus*
Belgium	75,219	82,192	71,167	29	47	21	75,351	82,405	71
Brazil	[1] 9,528	12,241	14,010	[1] 1,646	1,786	2,133	[1] 16,933	20,277	23
British South Africa	3,517	2,919	1,886	757	722	588	6,924	6,170	4
Denmark	2,824	3,060	5,885	549	599	580	5,295	5,756	8
France	23,327	78,995	26,131	141	155	126	23,960	79,695	26
Germany	86,117	91,430	84,415	167	172	179	86,868	92,204	85
Greece	7,660	7,934	5,901	9	14	16	7,702	7,999	5
Italy	45,280	43,300	58,407	14	18	34	45,322	43,383	58
Japan	1,818	2,019	2,276	203	200	191	2,733	2,921	3
Netherlands	71,027	58,570	65,788	2,204	2,242	2,051	80,946	68,657	75
Portugal	3,024	439	2,382				3,024	439	2,
Spain	5,933	4,927	1,543	1	1	1	5,937	4,930	1,
Sweden	6,810	6,333	6,333	89	79	79	7,210	6,689	6,
Switzerland	14,661	16,142	17,843	573	515	494	17,241	18,460	20,
United Kingdom	195,965	182,352	203,322	5,615	5,682	5,742	221,232	207,919	229,
Other countries	25,929	20,305	[2] 13,271	9,198	11,732	[2] 12,299	67,317	73,093	[2] 68,
Total	578,619	618,158	580,560	21,195	23,964	24,534	673,995	720,997	690,

[1] Data for 1909. [2] Preliminary.

OATS.

TABLE 23.—*Oat crop of countries named, 1911–1913.*

Country.	Area.			Production.		
	1911	1912	1913	1911	1912	1913
NORTH AMERICA.	*Acres.*	*Acres.*	*Acres.*	*Bushels.*	*Bushels.*	*Bushels.*
United States	37,763,000	37,917,000	38,399,000	922,298,000	1,418,337,000	1,121,768,0
[illegible]anada:						
[illegible]ew Brun[illegible]	208,000	195,000	195,000	5,986,000	5,607,000	5,946,0
[illegible]uebec	1,430,000	1,296,000	1,303,000	37,500,000	33,516,000	39,025,0
[illegible]ntari[illegible]	2,806,000	2,785,000	2,814,000	84,860,000	97,053,000	106,159,0
[illegible]anitob[illegible]	1,308,000	1,348,000	1,398,000	60,037,000	57,154,000	56,759,0
[illegible]askatch[illegible]	2,333,000	2,556,000	2,755,000	107,594,000	117,537,000	114,112,0
[illegible]lbert[illegible]	1,221,000	1,461,000	1,639,000	59,034,000	67,630,000	71,542,0
[illegible]the[illegible]	325,000	325,000	330,000	10,168,000	13,132,000	12,126,0
[illegible]	9,631,000	9,966,000	10,434,000	365,179,000	391,629,000	404,669,0
[illegible]	(1)	(1)	(1)	17,000	17,000	17,0
[illegible]				1,287,494,000	1,809,983,000	1,526,454,0
[illegible]						
[illegible]	1,980,000	2,548,000	2,946,000	47,192,000	69,169,000	115,879,0
[illegible]hi[illegible]	58,000	69,000	(1)	1,861,000	3,380,000	4,000,0
[illegible]	29,000	86,000	(1)	590,000	1,825,000	872,0
[illegible]				49,643,000	74,374,000	120,751,0

OATS—Continued.

TABLE 23.—*Oat crop of countries named, 1911–1913*—Continued.

[1] No official statistics.
[2] Area in 1907 (census).
[3] Includes 10 governments of Asiatic Russia.
[4] Included in European Russia.
[5] Census figures of 1911 repeated.

OATS—Continued.

TABLE 23.—*Oat crop of countries named, 1911-1913*—Continued.

Country.	Area. 1911	Area. 1912	Area. 1913	Production. 1911	Production. 1912	Production. 1913
AUSTRALASIA.						
Australia:	*Acres.*	*Acres.*	*Acres.*	*Bushels.*	*Bushels.*	*Bushels.*
Queensland	2,000	1,000	4,000	52,000	6,000	85,000
New South Wales	78,000	71,000	85,000	1,756,000	1,191,000	1,725,000
Victoria	393,000	302,000	439,000	10,005,000	4,730,000	8,586,000
South Australia	78,000	108,000	156,000	1,172,000	1,392,000	1,726,000
Western Australia	62,000	84,000	128,000	801,000	992,000	2,175,000
Tasmania	64,000	51,000	(1)	2,128,000	1,552,000	2,328,000
Total Australia	677,000	617,000	874,000	15,914,000	9,863,000	16,625,000
New Zealand	303,000	404,000	387,000	10,412,000	10,438,000	14,013,000
Total Australasia	980,000	1,021,000	1,261,000	26,326,000	20,301,000	30,638,000
Grand total				3,808,561,000	4,608,806,000	4,631,166,000

[1] No official statistics.

TABLE 24.—*Total production of oats in countries named in Table 23, 1895-1913.*

Year.	Production.	Year.	Production.	Year.	Production.	Year.	Production.
	Bushels.		*Bushels.*		*Bushels.*		*Bushels.*
1895	3,008,154,000	1900	3,166,002,000	1905	3,510,167,000	1910	4,182,410,000
1896	2,847,115,000	1901	2,862,615,000	1906	3,544,961,000	1911	3,808,561,000
1897	2,633,971,000	1902	3,626,303,000	1907	3,603,896,000	1912	4,608,806,000
1898	2,903,974,000	1903	3,378,034,000	1908	3,591,012,000	1913	4,631,166,000
1899	3,256,256,000	1904	3,611,302,000	1909	4,312,882,000		

TABLE 25.—*Average yield of oats in countries named, bushels per acre, 1890-1913.*

Year.	United States.	Russia (European).[1]	Germany.[1]	Austria.[1]	Hungary proper.[1]	France.[2]	United Kingdom.[3]
Average (1890-1899)	26.1	17.8	40.0	25.3	....	29.8	43.6
Average (1900-1909)	29.3	20.0	50.7	29.8	30.7	31.6	44.3
1904	32.1	25.7	46.2	24.3	25.6	27.2	44.2
1905	34.0	20.2	43.6	27.7	31.0	28.6	41.7
1906	31.2	15.1	55.7	34.1	34.2	27.0	43.8
1907	23.7	19.7	58.3	35.7	30.0	31.8	45.1
1908	25.0	20.1	50.2	32.0	26.8	29.6	43.5
1909	28.6	25.7	59.0	37.4	33.8	34.1	45.9
1910	31.6	22.5	51.3	31.5	26.8	29.8	44.3
1911	24.4	18.6	49.6	33.7	33.8	30.8	41.5
1912	37.4	23.6	54.1	36.2	31.1	31.9	41.7
1913	29.2	24.6	61.1	39.3	33.7	32.6	45.6
Average (1904-1913)	29.7	21.6	52.9	33.2	30.7	30.3	43.7

[1] Bushels of 32 pounds. [2] Winchester bushels. [3] Includes 10 governments of Asiatic Russia.

OATS—Continued.

TABLE 26.—*Acreage, production, value, exports, etc., of oats, United States, 1849–1913.*

NOTE.—Figures in *italics* are census returns; figures in roman are estimates of the Department of Agriculture. Estimates of acres are obtained by applying estimated percentages of increase or decrease to the published numbers of the preceding year, except that a revised base is used for applying percentage estimates whenever new census data are available.

[1] Quotations are for contract since 1906.
[2] Oatmeal not included 1866 to 1882, inclusive.
[3] Oatmeal not included 1867 to 1882, inclusive, and 1909.
[4] Figures adjusted to census basis.

OATS—Continued.

TABLE 27.—*Acreage, production, total farm value, and value per acre of oats, by State[s], 1912 and 1913.*

State.	Thousands of acres.		Production (thousands of bushels).		Value, basis Dec. 1 price (thousands of dollars).		Value (dollar[s]) per acre, basi[s] Dec. 1 price
	1913	1912	1913	1912	1913	1912	1913
Maine	140	133	5,600	4,602	3,080	2,347	22.00
New Hampshire	12	12	420	468	235	225	19.60
Vermont	79	77	3,081	3,311	1,602	1,589	20.28
Massachusetts	9	8	315	272	170	128	18.90
Rhode Island	2	2	52	57	26	26	13.00
Connecticut	11	11	308	338	169	166	15.40
New York	1,275	1,192	42,712	36,714	20,075	15,420	15.74
New Jersey	70	67	2,030	1,849	954	814	13.63
Pennsylvania	1,154	1,099	35,774	36,377	16,456	14,915	14.26
Delaware	4	4	122	122	62	55	15.56
Maryland	45	45	1,260	1,350	605	608	13.44
Virginia	195	175	4,192	3,885	2,180	2,020	11.18
West Virginia	115	111	2,760	3,108	1,408	1,461	12.24
North Carolina	230	204	4,485	3,794	2,736	2,352	11.90
South Carolina	360	324	8,460	6,966	6,007	4,598	16.68
Georgia	420	364	9,240	7,571	6,283	4,921	14.96
Florida	50	43	900	740	630	518	12.60
Ohio	1,800	2,120	54,360	93,280	21,744	30,782	12.08
Indiana	1,700	1,990	36,380	79,799	13,824	23,940	8.13
Illinois	4,375	4,220	104,125	182,726	39,568	54,818	9.04
Michigan	1,500	1,485	45,000	51,826	17,550	17,103	11.70
Wisconsin	2,275	2,272	83,038	84,746	30,724	27,119	13.50
Minnesota	2,980	2,948	112,644	122,932	36,046	31,962	12.10
Iowa	4,880	4,928	168,360	217,818	57,242	58,811	11.73
Missouri	1,250	1,125	26,500	37,125	11,925	12,994	9.54
North Dakota	2,250	2,300	57,825	95,220	17,348	20,948	7.71
South Dakota	1,590	1,550	42,135	52,390	14,326	13,098	9.01
Nebraska	2,250	2,275	59,625	55,510	22,658	16,653	10.07
Kansas	1,760	1,720	34,320	55,040	15,444	19,264	8.78
Kentucky	160	150	3,168	4,035	1,647	1,775	10.30
Tennessee	300	258	6,300	5,599	3,339	2,632	11.13
Alabama	325	260	6,662	5,200	4,597	3,224	14.14
Mississippi	140	113	2,800	1,966	1,764	1,180	12.60
Louisiana	45	34	990	707	564	361	12.54
Texas	1,000	865	32,500	31,140	16,575	13,390	16.58
Oklahoma	1,030	936	18,540	23,494	8,343	7,988	8.10
Arkansas	240	175	6,360	3,482	3,371	1,741	14.04
Montana	500	476	21,750	22,848	6,960	7,997	13.92
Wyoming	220	205	8,360	8,569	3,344	3,171	15.20
[illegible]olorado	305	290	10,675	12,412	4,697	4,717	15.40
[illegible]ico	50	53	1,500	1,839	900	828	18.00
[illegible]izo[illegible]	7	6	301	268	150	188	21.50
[illegible]tah	90	91	4,140	4,222	1,656	2,069	18.40
[illegible]da	11	10	473	400	307	208	27.95
[illegible]	325	348	15,112	17,017	4,836	5,956	14.88
[illegible]as[illegible]	300	284	14,250	13,689	5,700	5,476	19.00
[illegible]rego[illegible]	360	359	15,228	13,714	5,787	5,623	16.07
[illegible]alif[illegible]	210	200	6,636	7,800	3,982	4,290	18.96
[illegible]	38,399	37,917	1,121,768	1,418,337	439,596	452,469	11.45

OATS—Continued.

TABLE 28.—*Yield per acre and price per bushel of oats, by States.*

[1] The Territories.

OATS—Continued.

TABLE 29.—*Farm price of oats per bushel on first of each month, by geographical divisions, 1912 and 1913.*

TABLE 30.—*Condition of oat crop, United States, on first of months named, 1893–19*

OATS—Continued.

TABLE 31.—*Wholesale price of oats per bushel, 1899–1913.*

[1] No. 2 white since 1911.
[2] No. 2 grade, 1899–1906.
[3] No. 2 grade from 1899 to 1904 and 1906; "no grade" in 1905.
[4] No. 3 white, 1899–1906; standard since 1911.
[5] Quotations to May are for No. 3 white.

BARLEY.

TABLE 32.—*Barley crop of countries named, 1911–1913.*

[1] No official statistics.
[2] Area in 1907 (census).
[3] Exclusive of winter barley.
[4] Includes 10 governments of Asiatic Russia.

BARLEY—Continued.

TABLE 32.—*Barley crop of countries named, 1911–1913*—Continued.

Country.	Area.			Production.		
	1911	1912	1913	1911	1912	1913
Russia:	*Acres.*	*Acres.*	*Acres.*	*Bushels.*	*Bushels.*	*Bushels.*
Central Asia	420,000	375,000	....	5,694,000	5,578,000	....
Siberia	451,000	436,000	....	4,300,000	6,585,000	....
Transcaucasia	2,000	2,000	....	27,000	30,000	....
Total Russia (Asiatic)[1]	873,000	813,000	(²)	10,021,000	12,193,000	(²)
Total	....	....	....	98,764,000	104,846,000	103,219,000
AFRICA.						
Algeria	3,320,000	3,430,000	3,152,000	47,588,000	32,887,000	50,031,000
Tunis	1,193,000	1,119,000	1,117,000	13,319,000	3,070,000	7,266,000
Union of South Africa	(³)	(³)	(³)	1,359,000	⁴ 1,359,000	⁴ 1,359,000
Total	....	....	....	62,266,000	37,316,000	58,656,000
AUSTRALASIA.						
Australia:						
Queensland	6,000	2,000	9,000	86,000	16,000	151,000
New South Wales	7,000	11,000	17,000	85,000	133,000	349,000
Victoria	53,000	53,000	72,000	1,383,000	1,057,000	1,800,000
South Australia	34,000	41,000	69,000	562,000	725,000	1,360,000
Western Australia	3,000	4,000	6,000	35,000	38,000	96,000
Tasmania	5,000	6,000	(³)	147,000	153,000	274,000
Total Australia	108,000	117,000	....	2,298,000	2,122,000	4,030,000
New Zealand	34,000	32,000	37,000	950,000	1,296,000	1,420,000
Total Australasia	142,000	149,000	....	3,248,000	3,418,000	5,450,000
Grand total	....	....	....	1,373,286,000	1,458,001,000	1,616,154,000

¹ Exclusive of winter barley.
² Included in European Russia.
³ No official statistics.
⁴ Census figures of 1911 repeated.

TABLE 33.—*Total production of barley in countries named in Table 32, 1895–1913.*

Year.	Production.	Year.	Production.	Year.	Production.	Year.	Production.
	Bushels.		*Bushels.*		*Bushels.*		*Bushels.*
1895	915,504,000	1900	959,622,000	1905	1,180,053,000	1910	1,388,734,000
1896	932,100,000	1901	1,072,195,000	1906	1,296,579,000	1911	1,373,286,000
1897	864,605,000	1902	1,229,132,000	1907	1,271,237,000	1912	1,458,001,000
1898	1,030,581,000	1903	1,235,786,000	1908	1,274,897,000	1913	1,616,154,000
1899	965,720,000	1904	1,175,784,000	1909	1,458,263,000		

TABLE 34.—*Average yield of barley in countries named, bushels per acre, 1890–1913.*

Year.	United States.	Russia (European).¹	Germany.¹	Austria.¹	Hungary proper.¹	France.²	United Kingdom.²
Average:							
1890–1899	23.4	13.3	29.4	21.1	....	22.6	39.8
1900–1909	25.5	14.3	35.3	26.3	23.4	23.6	35.0
1904	27.2	14.4	33.7	22.8	19.7	22.0	32.3
1905	26.8	14.3	33.3	24.0	24.5	23.4	35.9
1906	28.3	13.0	35.2	26.1	26.8	20.8	36.1
1907	23.8	14.2	38.2	27.3	23.1	24.4	36.8
1908	25.1	14.2	34.9	25.2	21.3	22.6	34.9
1909	22.5	17.9	39.5	28.4	25.1	25.4	38.9
1910	22.5	16.3	34.4	24.9	19.7	23.5	34.3
1911	21.0	14.4	37.0	27.5	26.9	25.0	34.0
1912	29.7	16.2	40.7	29.7	26.9	26.1	33.1
1913	23.8	³18.4	41.3	29.7	26.5	25.6	35.1
Average (1904–1913)	25.1	15.3	36.8	26.6	24.0	23.9	35.1

¹ Bushels of 48 pounds. ² Winchester bushels. ³ Includes 10 governments of Asiatic Russia.

BARLEY—Continued.

TABLE *production, value, exports, etc., of barley, United States, 1849-1913.*

of the Department of Agricul-
of increase or decrease to the
d for applying percentage esti-

Year.	Acreage.	Average yield per acre.	Production.
	Acres.	*Bush.*	*Bushel*
1849...	....	.....	*5,167,*
1859...	....	.....	*15,826,*
1866...	493,000	22.9	11,284,
1867...	1,131,000	22.7	25,727,
1868...	937,000	24.4	22,896,
1869...	1,026,000	27.9	28,652,
1869...	....	......	*29,761,*
1870...	1,109,000	23.7	26,295,
1871...	1,114,000	24.0	26,718,
1872...	1,397,000	19.2	26,846,
1873...	1,387,000	23.1	32,044,
1874...	1,581,000	20.6	32,552,
1875...	1,790,000	20.6	36,909,
1876...	1,767,000	21.9	38,710,
1877...	1,669,000	21.4	35,638,
1878...	1,790,000	23.6	42,246,
1879...	1,681,000	24.0	40,283,
1879...	*1,998,000*	*22.0*	*43,997,*
1880...	1,843,000	24.5	45,165,
1881...	1,968,000	20.9	41,161,
1882...	2,272,000	21.5	48,954,
1883...	2,379,000	21.1	50,136,
1884...	2,609,000	23.5	61,203,
1885...	2,729,000	21.4	58,360,
1886...	2,653,000	22.4	59,428,
1887...	2,902,000	19.6	56,812,
1888...	2,996,000	21.3	63,884,
1889...	3,221,000	24.3	78,333,
1889...	*3,221,000*	*24.3*	*78,333,*
1890...	3,135,000	21.4	67,168,
1891...	3,353,000	25.9	86,839,
1892...	3,400,000	23.6	80,097,
1893...	3,220,000	21.7	69,869,
1894...	3,171,000	19.4	61,400,
1895...	3,300,000	26.4	87,073,
1896...	2,951,000	23.6	69,695,
1897...	2,719,000	24.5	66,685,
1898...	2,583,000	21.6	55,792,
1899...	2,878,000	25.5	73,382,
1899...	*4,470,000*	*26.8*	*119,635,*
1900...	2,894,000	20.4	58,926,
1901...	4,296,000	25.6	109,933,
1902...	4,661,000	29.0	134,954,
1903...	4,993,000	26.4	131,861,
1904...	5,146,000	27.2	139,749,
1905...	5,096,000	26.8	136,551,
1906...	6,324,000	28.6	178,916,
1907...	6,448,000	23.8	153,597,
1908...	6,646,000	25.1	166,756,
1909...	7,011,000	24.3	170,284,
1909...	*7,698,000*	*22.5*	*173,321,*
1910 [2]	7,743,000	22.5	173,832,
1911...	7,627,000	21.0	160,240,
1912	7,530,000	29.7	223,824,
1913...	7,499,000	23.8	178,189,

[1] Prices 1895 to 1908 for No. 3 grade; low malting to fancy since 1908.
[2] Figures adjusted to census basis.

BARLEY—Continued.

Table 36.—*Acreage, production, and farm value of barley, by States, 1915.*

[000 omitted.]

State.	Acreage.	Production.	Farm value, Dec. 1	State.	Acreage.	Production.	Farm value, Dec. 1.
	Acres.	*Bushels.*	*Dollars.*		*Acres.*	*Bushels.*	*Dollars.*
Maine	5	140	112	Kansas	240	1,944	1,069
New Hampshire	1	28	22	Kentucky	3	90	63
Vermont	12	384	307	Tennessee	2	50	35
New York	77	2,056	1,419	Texas	7	168	136
Pennsylvania	7	182	129	Oklahoma	7	63	50
Maryland	5	145	93	Montana	60	1,860	893
Virginia	11	286	200	Wyoming	13	390	242
Ohio	40	960	557	Colorado	100	3,250	1,820
Indiana	8	200	100	New Mexico	4	96	69
Illinois	54	1,404	800	Arizona	38	1,482	1,082
Michigan	85	2,108	1,265	Utah	30	1,155	635
Wisconsin	725	18,125	10,875	Nevada	12	492	443
Minnesota	1,450	34,800	16,704	Idaho	180	7,560	3,629
Iowa	400	10,000	5,500	Washington	180	7,290	3,791
Missouri	5	110	66	Oregon	120	4,200	2,310
North Dakota	1,275	25,500	10,200	California	1,275	33,150	22,542
South Dakota	958	16,765	7,712				
Nebraska	110	1,760	862	United States	7,499	178,189	95,731

Table 37.—*Yield per acre, price per bushel, and value per acre of barley, by States.*

[1] Basis, Dec. 1 price.

[2] The Territories.

BARLEY—Continued.

Table 38.—*Condition of barley crop, United States, on first of months named, 1893–1913.*

Year.	June.	July.	August.	When harvested.	Year.	June.	July.	August.	When harvested.
	P. ct.	*P. ct.*	*P. ct.*	*P. ct.*		*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*
1893	88.3	88.8	84.6	83.8	1904	90.5	88.5	88.1	87.[illegible]
1894	82.2	76.8	69.6	71.5	1905	93.7	91.5	89.5	87.[illegible]
1895	90.3	91.9	87.2	87.6	1906	93.5	92.5	90.3	89.[illegible]
1896	98.0	88.1	82.9	83.1	1907	84.9	84.4	84.5	78.[illegible]
1897	87.4	88.5	87.5	86.4	1908	89.7	86.2	83.1	81.[illegible]
1898	78.8	85.7	79.3	79.2	1909	90.6	90.2	85.4	80.[illegible]
1899	91.4	92.0	93.6	86.7	1910	89.6	73.7	70.0	69.[illegible]
1900	86.2	76.3	71.6	70.7	1911	90.2	72.1	66.2	65.[illegible]
1901	91.0	91.3	86.9	83.8	1912	91.1	[illegible].3	89.1	[illegible]
1902	93.6	93.7	90.2	89.7	1913	87.1	76.6	74.9	73.[illegible]
1903	91.5	86.8	83.4	82.1					

Table 39.—*Farm price of barley per bushel on first of each month, by geographical divisions, 1912 and 1913.*

BARLEY—Continued.

TABLE 40.—*Wholesale price of barley per bushel, 1899–1913.*

Date	Cincinnati.		Chicago.		Milwaukee.		Minneapolis.		San Francisco.	
	Extra No. 3 spring.[1]		Low malting to fancy.[2]		Extra No. 3.[3]		All grades.		No. 1 feed[4] (per 100 lbs.).	
	Low.	High.	Low.	High.	Low.	High.	Low.	High.	Low.	High.
	Cents.	*Cents.*	*Cents.*	*Cents.*	*Cents.*	*Cents.*	*Cents.*	*Cents.*	*Dolls.*	*Dolls.*
1899	44	56	34	54	......	......	31	47	0.85	1.47½
1900	44¾	66	34	62	......	......	32	59	.67½	.75
1901	58	70	36	65	......	......	25	62	.73¾	.85
1902	55	74	35	73	......	......	30	70	.80	1.32½
1903	55	71	42	63	48	63	32	68	.90	1.22½
1904	55	69	35	61	41	61	28	56	.95	1.15
1905	52	58	36½	55	41	54	30	48	1.02½	1.35
1906	52	62	38	58	43½	56	31	51	......	......
1907	54	113	45	110	49	111	40	108	1.12½	1.72½
1908	67	115	49	106	50	105	44	102	1.22¾	1.57½
1909	64	84	50	82½	54	82½	40	79	1.35	1.70
1910	67	86	50	90	59	90	48	76½	.95	1.50
1911	88	125	70	139	80	130	58	120	1.10	1.98½
1912	55	132	40	140	64	138	33	130	1.15	1.95
1913.										
January	54½	70	48	71	64	73	42	63	1.32½	1.40
February	57	65	45	71	65	72	42	59	1.30	1.37½
March	57	65	42	67	60	68	39	57	1.30	1.37½
April	57	65	42	69	60	66	40	58	1.32½	1.50
May	57	65	45	68	60	68	42	62	1.46¼	1.50
June	......	......	48	64	63	68	45	61	1.32½	1.47½
July	......	......	45	64	60	65	42	59	1.27½	1.35
August	57	57	43	77½	60	76	44	71	1.22½	1.40
September	75	80	52	85	71	82	52	73	1.35	1.40
October	72	80	48	85	76	82	44	71	1.35	1.40
November	70	77	48	80	67	80	42	68	1.30	1.37½
December	62	75	50	79	65	78	43	69	1.30	1.32
Year	54½	80	42	85	60	82	39	73	1.22½	1.50

[1] No. 3 spring since 1911.
[2] No. 3, 1899–1908.
[3] Medium since 1912.
[4] No. 1 brewing 1899–1902, and 1907.

RYE.

TABLE 41.—*Rye crop of countries named, 1911-1913.*

	Area.	Production.

[1] Less than 500 acres.
[2] No official statistics of area.
[3] Area in 1907 (census).
[4] Includes 10 governments of Asiatic Russia.
[5] Included under European Russia.

RYE—Continued.

TABLE 41.—*Rye crop of countries named, 1911-1913*—Continued.

Country.	Area. 1911	Area. 1912	Area. 1913	Production. 1911	Production. 1912	Production. 1913
AUSTRALASIA.						
Australia:	*Acres.*	*Acres.*	*Acres.*	*Bushels.*	*Bushels.*	*Bushels.*
Queensland				2,000		2,000
New South Wales	4,000	2,000	3,000	59,000	26,000	42,000
Victoria	3,000	1,000	1,000	34,000	10,000	18,000
South Australia	1,000	1,000	1,000	8,000	7,000	10,000
Western Australia	1,000		1,000	6,000	3,000	4,000
Tasmania	1,000	2,000	(1)	24,000	13,000	15,000
Total Australia	10,000	6,000		133,000	59,000	91,000
New Zealand	4,000	6,000	(1)	109,000	90,000	90,000
Total Australasia	14,000	12,000		242,000	149,000	181,000
Grand total				1,573,933,000	1,889,894,000	1,885,147,000

[1] No official statistics of area.

TABLE 42.—*Total production of rye in countries named in Table 41, 1895-1913.*

Year.	Production.	Year.	Production.	Year.	Production.	Year.	Production.
	Bushels.		*Bushels.*		*Bushels.*		*Bushels.*
1895	1,468,212,000	1900	1,557,634,000	1905	1,495,751,000	1910	1,673,473,000
1896	1,499,250,000	1901	1,416,022,000	1906	1,433,395,000	1911	1,573,933,000
1897	1,300,645,000	1902	1,617,845,000	1907	1,538,778,000	1912	1,889,894,000
1898	1,461,171,000	1903	1,659,961,000	1908	1,590,057,000	1913	1,885,147,000
1899	1,583,179,000	1904	1,742,112,000	1909	1,747,123,000		

TABLE 43.—*Average yield of rye in countries named, bushels per acre, 1890-1913.*

Year.	United States.	Russia (European).[1]	Germany.[1]	Austria.[1]	Hungary proper.[1]	France.[2]	Ireland.[1]
Average (1890-1899)	13.9	10.4	20.9	16.1		17.6	25.2
Average (1900-1909)	15.7	11.5	25.6	19.0	17.6	17.1	27.5
1904	15.2	13.7	26.3	19.3	17.0	16.6	26.0
1905	16.5	10.1	24.9	20.2	19.4	18.5	27.0
1906	16.7	8.8	25.1	19.9	19.8	16.3	27.6
1907	16.4	10.8	25.8	18.9	16.0	18.2	27.0
1908	16.4	11.0	28.0	22.0	17.5	16.8	29.2
1909	13.4	12.6	28.8	22.3	17.8	18.1	30.8
1910	16.0	12.3	27.1	21.3	18.9	14.7	30.3
1911	15.6	10.5	28.2	20.9	18.7	15.8	29.0
1912	16.8	14.3	29.5	23.3	19.4	16.5	30.6
1913	16.2	[3]13.4	30.4	22.0	19.5	17.8	30.0
Average (1904-1913)	15.9	11.8	27.4	21.0	18.4	16.9	28.8

[1] Bushels of 56 pounds. [2] Winchester bushels. [3] Includes 10 governments of Asiatic Russia.

RYE—Continued.

TABLE 44.—*Acreage, production, value, and exports of rye, United States, 1849–1913.*

NOTE.—Figures in figures in roman are estimates of the Department of Agri-
culture. Estimates o pplying estimated percentages of increase or decrease to the
published numbers o ept that a revised base is used for applying percentage esti-
mates whenever new le.

[1] Figures adjusted to census basis.

RYE—Continued.

TABLE 45.—*Acreage, production, and value of rye, by States, 1913.*

[000 omitted.]

State.	Acreage.	Production.	Farm value Dec. 1.	State.	Acreage.	Production.	Farm value Dec. 1.
	Acres.	*Bush.*	*Dollars.*		*Acres.*	*Bush.*	*Dollars.*
Vermont	1	18	16	North Dakota	125	1,800	810
Massachusetts	3	56	55	South Dakota	50	660	330
Connecticut	7	135	124	Nebraska	120	1,740	1,044
New York	133	2,288	1,716	Kansas	45	630	472
New Jersey	70	1,260	1,008	Kentucky	22	273	298
Pennsylvania	280	4,900	3,626	Tennessee	17	204	208
Delaware	1	14	11	Alabama	1	11	15
Maryland	27	389	296	Texas	2	30	30
Virginia	58	713	578	Oklahoma	5	48	41
West Virginia	17	230	200	Arkansas	1	12	11
North Carolina	46	474	465	Montana	10	210	116
South Carolina	3	32	48	Wyoming	4	76	49
Georgia	13	124	167	Colorado	20	340	204
Ohio	97	1,600	1,104	Utah	12	204	122
Indiana	103	1,566	971	Idaho	3	66	38
Illinois	49	808	525	Washington	8	168	101
Michigan	375	5,362	3,324	Oregon	20	350	262
Wisconsin	425	7,438	4,240	California	8	120	90
Minnesota	300	5,700	2,736				
Iowa	60	1,092	655	United States	2,557	41,381	26,220
Missouri	16	240	180				

TABLE 46.—*Condition of rye crop, United States, on first of months named, 1889–1914.*

RYE—Continued.

TABLE 47.—*Yield per acre, price per bushel, and value per acre of rye, by States.*

[1] Basis, Dec. 1 price.

[2] The Territories.

RYE—Continued.

Table 48.—*Wholesale price of rye per bushel, 1899–1913.*

Date.	Philadelphia.		Cincinnati.		Chicago.		Duluth.		San Francisco (per 100 lbs.).	
			No. 2.		No. 2.					
	Low.	High.	Low.	High.	Low.	High.	Low.	High.	Low.	High.
	Cents.	*Cents.*	*Cents.*	*Cents.*	*Cents.*	*Cents.*	*Cents.*	*Cents.*	*Dolls.*	*Dolls.*
1899	....	....	56	68	49	62	47	59½	....	....
1900	....	....	51½	67	44½	60½	46	60½	....	....
1901	58	71½	46	73	46¾	63¾	46½	62½	0.75	0.87½
1902	54	71	51	71½	48	67½	46	64	.77½	1.15
1903	56	68½	54	63	48	60	48	55½	1.10	1.30
1904	65	96	61	87	51	81	54½	90	1.25	1.47½
1905	63	90½	56	87	57½	84	55½	78	1.40	1.75
1906	55½	67	58	72½	55½	68	53	61	....	....
1907	75	100	66	93	60	91½	57	88	1.35	1.52½
1908	80	95	78	89	72	87	60	80	1.35	1.52½
1909	75	95	70	92	67	91	62	88	1.55	2.05
1910	75	92	73	87	72	82	67	78½	1.50	2.00
1911	78	107	79	101	80	113	72	100	1.40	1.60
1912	68	105	62	100	58	96½	53	91½	1.40	1.72½
1913.										
January	67	70	65½	70	62	65½	52	58	1.37½	1.47½
February	67	70	65	70	58	65	53	58	1.32½	1.40
March	65	67	64	67	58	62½	52	56	1.32½	1.40
April	65	66	64	70	60	64	53	59	1.35	1.42½
May	65	66	60	66	60	64	55	59	1.35	1.42½
June	65	65	60	66	60	63½	52½	59	1.35	1.45
July	65	65	60	64	61	64½	54½	59	1.40	1.45
August	65	65	62	68½	61	70½	55	65	1.35	1.42½
September	65	75	60	72	64½	70	55	63	1.35	1.50
October	70	77	64	70	62	67	54	57	1.45	1.50
November	71	75	62	66	61	66	52	54	1.45	1.60
December	70	75	62	66	61	65	50	55	1.60	1.65
Year	65	77	60	72	58	70½	50	65	1.32½	1.65

Table 49.—*Farm price of rye per bushel on first of each month, by geographical divisions, 1912 and 1913.*

Month.	South Central States.		Far Western States.	
	1913	1912	1913	1912
	Cts.	*Cts.*	*Cts.*	*Cts.*
January	89.8	96.0	66.2	83.4
February	86.8	95.8	65.2	82.4
March	88.0	96.0	61.9	86.3
April	91.8	97.2	63.5	89.1
May	88.5	94.2	63.6	86.8
June	86.3	98.0	64.5	83.2
July	86.7	93.8	69.6	85.5
August	81.0	91.0	69.6	81.5
September	80.2	90.2	65.4	80.9
October	90.8	94.6	63.6	64.4
November	91.3	93.2	62.5	62.9
December	92.9	93.7	64.0	64.4
Average	88.0	93.7	64.7	74.3

BUCKWHEAT.

TABLE 50.—*Acreage, production, and value of buckwheat in the United States, 1849–1913.*

NOTE.—Figures in *italics* are census returns; figures in roman are estimates of the Department of Agriculture. Estimates of acres are obtained by applying estimated percentages of increase or decrease to the published numbers of the preceding year, except that a revised base is used for applying percentage estimates whenever new census data are available.

[1] Figures adjusted to census basis.

TABLE 51.—*Acreage, production, and value of buckwheat in the United States in 1913.*

[000 omitted.]

State.	Acreage.	Production.	Farm value Dec. 1	State.	Acreage.	Production.	Farm value Dec. 1.
	Acres.	*Bush.*	*Dolls.*		*Acres.*	*Bush.*	*Dolls.*
Maine	13	416	233	Ohio	18	324	246
New Hampshire	1	31	20	Indiana	5	92	69
Vermont	8	200	160	Illinois	4	68	54
Massachusetts	2	34	27	Michigan	60	900	630
Connecticut	3	51	48	Wisconsin	18	297	205
New York	280	4,001	3,213	Minnesota	6	99	63
New Jersey	10	220	167	Iowa	6	84	65
Pennsylvania	280	5,180	3,781	Missouri	2	22	19
Delaware	3	51	35	Nebraska	1	20	16
Maryland	11	182	136	Kansas	1	10	8
Virginia	23	531	425	Tennessee	3	45	34
West Virginia	38	798	622				
North Carolina	9	174	136	United States	805	13,833	10,445

TABLE 52.—*Condition of buckwheat crop, United States, on first of months named, 1898–1913.*

BUCKWHEAT—Continued.

TABLE 53.—*Farm price of buckwheat per bushel on first of each month, by geographical divisions, 1912 and 1913.*

TABLE 54.—*Yield per acre, price per bushel, and value per acre of buckwheat, by States.*

[1] Basis, Dec. 1 price.

POTATOES.

TABLE 55.—*Acreage and production of potatoes in countries named, 1910–1912.*

Country.	Area.			Production.		
	1910	1911	1912	1910	1911	1912
NORTH AMERICA						
United States						
Canada:						
Prince Edward Island						
Nova Scotia						
New Brunswick						
Quebec						
Ontario						
Manitoba						
Saskatchewan						
Alberta						
British Columbia						
Total, Canada						
Mexico						
Newfoundland						
Total						
SOUTH AMERICA.						
Argentina						
Chile						
Total						
EUROPE.						
Austria-Hungary:						
Austria						
Hungary proper						
Croatia-Slavonia						
Bosnia-Herzegovina						
Total, Austria-Hungary						
Belgium						
Bulgaria						
Denmark						
Finland						
France						
Germany						
Greece						
Italy						
Luxemburg						
Malta						
Netherlands						
Norway						
Roumania [2]						
Do. [3]						
Russia:						
Russia proper						
Poland						
Northern Caucasia						
Total, Russia (European)						
Servia						
Spain						
Sweden						
Switzerland						
United Kingdom:						
England						
Scotland						
Wales						
Ireland						
Total, United Kingdom						
Total						

[1] No date. [2] Grown alone. [3] Grown with corn.

POTATOES—Continued.

TABLE 55.—*Acreage and production of potatoes in countries named, 1910–1912*—Contd.

Country.	Area.			Production.		
	1910.	1911.	1912.	1910.	1911.	1912.
ASIA.	*Acres.*	*Acres.*	*Acres.*	*Bushels.*	*Bushels.*	*Bushels.*
Japan	168,000	169,000	173,000	24,718,000	25,168,000	25,669,000
Russia, Asiatic	404,000	423,000	479,000	29,246,000	32,956,000	38,796,000
Total				53,964,000	58,124,000	64,465,000
AFRICA.						
Algeria	43,000	43,000	45,000	1,777,000	1,687,000	1,607,000
Union of South Africa:						
Cape of Good Hope	(1)	(1)	(1)	1,283,000	1,283,000	1,283,000
Natal	(1)	(1)	(1)	627,000	627,000	627,000
Transvaal	(1)	(1)	(1)	1,272,000	1,272,000	1,272,000
Orange Free State	(1)	(1)	(1)	618,000	618,000	618,000
Total, Union of South Africa				[2] 3,800,000	3,800,000	[2] 3,800,000
Total				5,577,000	5,487,000	5,407,000
AUSTRALASIA.						
Australia:						
Queensland	8,000	8,000	8,000	506,000	584,000	489,000
New South Wales	36,000	44,000	43,000	3,739,000	4,519,000	2,806,000
Victoria	62,000	63,000	48,000	6,532,000	6,097,000	4,446,000
South Australia	8,000	8,000	7,000	693,000	893,000	846,000
Western Australia	2,000	2,000	3,000	222,000	219,000	348,000
Tasmania	21,000	26,000	22,000	2,758,000	2,617,000	2,321,000
Total, Australia	137,000	151,000	131,000	14,450,000	14,929,000	11,256,000
New Zealand	31,000	29,000	28,000	6,739,000	5,283,000	5,410,000
Total, Australasia	168,000	180,000	159,000	21,189,000	20,212,000	16,666,000
Grand total				5,242,278,000	4,798,902,000	5,898,531,000

[1] No data. [2] Census figures of 1911 repeated.

TABLE 56.—*Total production of potatoes in countries named in Table 55, 1900–1912.*

Year.	Production.	Year.	Production.	Year.	Production.	Year.	Production.
	Bushels.		*Bushels.*		*Bushels.*		*Bushels.*
1900	4,382,031,000	1904	4,298,049,000	1908	5,295,043,000	1911	4,798,902,000
1901	4,669,958,000	1905	5,254,598,000	1909	5,595,567,000	1912	5,898,531,000
1902	4,674,000,000	1906	4,789,112,000	1910	5,242,278,000		
1903	4,409,793,000	1907	5,122,078,000				

TABLE 57.—*Average yield of potatoes in countries named, bushels per acre, 1900–1913.*

Year.	United States.	Russia (European).[1]	Germany.[1]	Austria.[1]	Hungary proper.[1]	France.[1]	United Kingdom.[1]
Average (1900-1909)	91.4	99.9	200.0	151.1	118.7	133.8	193.8
1903	84.7	91.1	197.0	126.2	125.0	120.2	166.1
1904	110.4	88.4	164.2	126.1	86.2	123.4	195.6
1905	87.0	106.6	216.7	182.5	126.8	142.5	218.8
1906	102.2	94.9	193.3	158.4	128.7	99.5	192.2
1907	95.4	102.4	205.3	173.2	126.6	136.2	171.0
1908	85.7	102.9	209.2	154.0	96.6	163.7	231.1
1909	106.1	111.5	208.9	157.3	125.2	160.3	222.1
1910	93.8	121.1	196.1	160.0	117.4	81.9	209.1
1911	80.9	104.2	153.9	137.2	106.3	121.8	241.5
1912	113.4	121.5	223.5	149.0	129.2	145.8	177.0
1913	90.4		235.8		112.2		242.0
Average (1903-1912)	96.0	104.6	196.8	152.4	116.8	129.5	202.4

[1] Bushels of 60 pounds.

POTATOES—Continued.

TABLE *production, value, exports, etc., of potatoes, United States, 1849-1913*

n roman are estimates of the Department of Agricul-
stimated percentages of increase or decrease to the
a revised base is used for applying percentage esti-

Production.	Average farm price per bushel Dec. 1.	Farm value Dec. 1.	Chicago price per bushel, Burbank.[1] December. Low.	December. High.	Following May. Low.	Following May. High.	Domestic exports, fiscal year beginning July 1.	Imports during fiscal year beginning July 1.
Bushels.	*Cts.*	*Dollars.*	*Cts.*	*Cts.*	*Cts.*	*Cts.*	*Bushels.*	*Bushels.*
65,798,000							*155,595*	
111,149,000							*380,372*	
107,201,000	47.3	50,723,000					512,380	196,265
97,783,000	65.9	64,462,000					378,605	209,555
106,090,000	59.3	62,919,000					506,249	138,470
133,886,000	42.9	57,481,000					596,968	75,336
143,337,000								
114,775,000	65.0	74,621,000					553,070	458,758
120,462,000	53.9	64,905,000					621,537	96,259
113,516,000	53.5	60,692,000					515,306	346,840
106,069,000	65.2	69,154,000					497,413	549,073
105,981,000	61.5	65,223,000					609,642	198,757
166,877,000	34.4	57,358,000					704,379	92,148
124,827,000	61.9	77,320,000					529,650	3,205,555
170,092,000	43.7	74,272,000					744,409	628,584
124,127,000	58.7	72,924,000					625,342	2,624,149
181,626,000	43.6	79,154,000					696,060	721,868
169,459,000								
167,660,000	48.3	81,062,000					638,840	2,170,372
109,145,000	91.0	99,291,000					406,296	8,789,860
170,973,000	55.7	95,305,000					430,443	2,362,362
208,164,000	42.2	87,849,000					554,613	425,408
190,642,000	39.6	75,524,000					390,868	656,633
175,029,000	44.7	78,153,000			33	60	494,948	1,937,416
168,051,000	46.7	78,442,000	44	47	65	90	434,864	1,432,490
134,103,000	68.2	91,507,000	70	83	65	85	403,880	8,259,538
202,365,000	40.2	81,414,000	30	37	24	45	471,955	863,360
204,881,000	35.4	72,611,000	33	45	[illegible]	60	406,618	3,415,578
217,546,000								
148,290,000	75.8	112,342,000	82	93	95	110	341,189	5,401,912
254,424,000	35.8	91,013,000	30	40	30	50	557,022	186,871
156,655,000	66.1	103,568,000	60	72	70	98	845,720	4,317,021
183,034,000	59.4	108,662,000	51	[illegible]	64	88	803,111	3,002,578
170,787,000	53.6	91,527,000	43	58	40	70	572,957	1,341,533
297,237,000	26.6	78,985,000	18	[illegible]	10	23	680,049	175,240
252,235,000	28.6	72,182,000	18	26	19	26	926,646	246,178
164,016,000	54.7	89,643,000	50	62	60	87	605,187	1,171,378
192,306,000	41.4	79,575,000	30	36	33	52	579,833	530,420
228,783,000	39.0	89,329,000	35	46	27	39	909,472	155,861
273,318,000								
210,927,000	43.1	90,811,000	[illegible]	48	35	60	741,483	371,911
187,598,000	76.7	143,979,000	75	82	58	100	528,484	7,656,162
284,633,000	47.1	134,111,000	42	[illegible]	42	60	843,075	358,505
247,128,000	61.4	151,638,000	[illegible]	66	95	116	484,042	3,166,581
332,830,000	45.3	150,673,000	32	38	20	25	1,163,270	181,199
260,741,000	64.7	100,821,000	55	66	48	73	1,000,326	1,948,160
308,038,000	51.1	157,547,000	40	43	55	75	1,530,461	176,917
298,262,000	61.8	184,184,000	46	58	50	80	1,208,894	408,952
278,985,000	70.6	197,039,000	[illegible]	77	70	150	763,651	8,383,966
376,537,000	54.9	206,545,000	20	58	16	34	999,476	353,208
389,195,000								
349,032,000	55.7	194,566,000	80	[illegible]	35	75	[illegible]	218,984
292,737,000	79.9	233,778,000	70	100	90	200	[illegible]	[illegible]
420,647,000	50.5	212,550,000	40	65	38	70	2,028,361	227,290
331,525,000	68.7	227,903,000	50	70				

[1] Fair to fancy since 1910.

[2] Figures adjusted to census basis.

POTATOES—Continued.

TABLE 59.—*Acreage, production, and value of potatoes, by States, 1913.*

[000 omitted]

TABLE 60.—*Condition of potato crop, United States, on first of months named, 1893–1913.*

Year.	July.	Aug.	Sept.	Oct.	Year.	July.	Aug.	Sept.	Oct.
	P. ct.	*P. ct.*	*P. ct.*	*P. ct.*		*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*
1893	94.8	86.0	71.8	71.2	1904	93.9	94.1	91.6	89.5
1894	92.3	74.0	62.4	64.3	1905	91.2	87.2	80.9	74.3
1895	91.5	89.7	90.8	87.4	1906	91.5	89.0	85.3	82.2
1896	99.0	94.8	83.2	81.7	1907	90.2	88.5	80.2	77.0
1897	87.8	77.9	66.7	61.6	1908	89.6	82.9	73.7	68.7
1898	95.5	83.9	77.7	72.5	1909	93.0	85.8	80.9	78.8
1899	93.8	93.0	86.3	81.7	1910	86.3	75.8	70.5	71.8
1900	91.3	88.2	80.0	74.4	1911	76.0	62.3	59.8	62.3
1901	87.4	62.3	52.2	54.0	1912	88.9	87.8	87.2	85.1
1902	92.9	94.8	89.1	82.5	1913	86.2	78.0	69.9	67.7
1903	88.1	87.2	84.3	74.6					

POTATOES—Continued.

TABLE 61.—*Yield per acre, price per bushel, and value per acre of potatoes, by States*

[1] Basis, Dec. 1 price.

[2] The Territories.

POTATOES—Continued.

Table 62.—*Wholesale price of potatoes per bushel, 1899–1913.*

[illegible]

[1] Fair to fancy since 1910. [2] Per barrel 1899 and 1902–1904. [3] Early Ohio, home grown.

Table 63.—*Farm price of potatoes per bushel on first of each month, 1912–13.*

[illegible]

SWEET POTATOES.

TABLE 64.—*Acreage, production, and value of sweet potatoes in the United States, 1849–1913.*

Year.
1849[1]
1859[1]
1869[1]
1879[1]
1889[1]
1899[1]
1909[1]
1910
1911
1912
1913

[1] Census figures.

TABLE 65.—*Acreage, production, and value of sweet potatoes in the United States, 1913.*

[000 omitted.]

State.	Acreage.	Production.	Farm value Dec. 1.	State.	Acreage.	Production.	Farm value Dec. 1.
	Acres	*Bushels.*	*Dollars*		*Acres.*	*Bushels.*	*Dollars.*
New Jersey	23	3,174	2,476	Missouri	6	336	252
Pennsylvania	1	110	99	Kansas	5	250	275
Delaware	5	675	405	Kentucky	9	675	634
Maryland	8	1,128	677	Tennessee	20	1,600	1,[illegible]
Virginia	33	3,564	2,495	Alabama	70	6,650	4,456
West Virginia	2	182	182	Mississippi	55	5,390	3,342
North Carolina	80	8,000	4,880	Louisiana	60	5,100	3,570
South Carolina	50	4,600	3,450	Texas	50	4,000	3,800
Georgia	83	7,221	4,910	Oklahoma	6	384	[illegible]
Florida	21	2,310	1,732	Arkansas	20	1,800	1,440
Ohio	1	90	95	California	6	1,020	1,[illegible]
Indiana	1	78	80				
Illinois	8	560	594	United States	625	59,057	42,[illegible]
Iowa	2	160	240				

TABLE 66.—*Condition of sweet-potato crop, United States, on first of months named, 1893–1913.*

SWEET POTATOES—Continued.

TABLE 67.—*Yield per acre, price per bushel, and value per acre of sweet potatoes, by States.*

[1] Basis, Dec. 1 price.

TABLE 68.—*Wholesale price of sweet potatoes per barrel, 1899–1913.*

[illegible]	Baltimore.		St. Louis.		New Orleans.		New York.			
							Jersey.		Southern.	
	Low.	High.	Low.	High.	Low.	High.	Low.	High.	Low	High.
[illegible]	$0.70	$5.00	$0.63	$3.00	$0.80	$2.50	$1.00	$4.50	$0.75	$4.50
[illegible]	.75	4.50	1.00	6.25	1.00	2.00	1.25	5.00	.50	3.00
[illegible]	.50	6.00	.88	8.75	.75	1.75	1.50	4.00	.50	3.25
[illegible]	.75	5.00	.63	7.50	1.25	2.75	1.50	5.25	.75	5.00
[illegible]	.75	4.00	.75	6.25	.75	2.50	1.50	4.00	.50	5.00
[illegible]	.75	5.00	.88	5.50	.75	1.75	1.00	5.00	.50	4.50
[illegible]	.75	4.50	.50	5.00	.50	2.00	1.25	5.50	.35	4.50
[illegible]	.60	4.25	.60	5.00	1.25	2.50	1.25	3.50	.50	4.50
[illegible]	1.00	5.00	.75	7.50	1.00	2.75	1.00	4.00	1.50	6.00
[illegible]	1.00	5.00	.88	7.50	1.00	2.75	1.50	4.50	1.00	5.00
[illegible]	.85	5.50	.38	6.25	.75	2.75	1.25	4.00	.75	4.50
[illegible]	1.00	4.00	.50	4.38	1.00	2.40	1.00	3.00	.30	5.00
[illegible]	1.25	6.25	1.25	6.25	1.00	3.00	1.50	3.75	1.00	7.00
[illegible]	1.00	6.00	.75	5.00	1.75	2.00	1.50	3.50	.50	6.00

SWEET POTATOES—Continued.

TABLE 68.—*Wholesale price of sweet potatoes per barrel, 1899–1913*—Continued.

Date.	Baltimore.		St. Louis.		New Orleans.		New York.			
							Jersey.		Southern.	
	Low.	High.	Low.	High.	Low.	High.	Low.	High.	Low.	High.
1913.										
January	$2.25	$3.25	$2.00	$3.00	$2.00	$2.00	$2.00	$3.00	....	....
February	2.25	3.25	1.63	2.88	2.00	2.00	....	....	....	....
March	2.00	3.50	1.88	3.13	2.00	2.00	....	....	$1.75	$2.2
April	2.00	3.50	2.25	3.13	2.00	2.00	....	....	1.75	2.5
May	2.50	3.50	2.25	3.38	2.00	2.00	....	....	....	....
June	....	....	2.50	3.75	2.00	2.00	....	....	....	....
July	3.50	7.00	5.00	6.25	2.00	2.00	....	....	1.50	5.5
August	1.75	3.50	3.00	5.50	2.00	2.00	2.00	3.50	.75	4.2
September	1.15	2.00	1.25	4.38	2.00	2.00	1.75	2.75	.75	2.2
October	1.00	1.65	1.00	2.75	2.00	2.00	1.25	2.25	.50	1.8
November	.75	1.50	.88	1.88	2.00	2.00	1.25	1.87	.40	1.5
December	.75	2.00	1.00	2.85	....	....	1.25	2.00	.90	1.7
Year	.75	7.00	.88	6.25	2.00	2.00	1.25	3.50	.40	5.5

HAY.

TABLE 69.—*Acreage, production, value, and exports of hay, United States, 1849–191*

NOTE.—Figures in *italics* are census returns; figures in roman are estimates of the Department of Agr culture. Estimates of acres are obtained by applying estimated percentages of increase or decrease t the published numbers of the preceding year, except that a revised base is used for applying percenta estimates whenever new census data are available.

Year.	Acreage.	Average yield per acre.	Production.	Average farm price per ton Dec. 1.	Farm value Dec. 1.	Chicago prices No. 1 timothy per ton, by carload lots.				Domesti exports fiscal year beginning July 1.
						December.		Following May.		
						Low.	High.	Low.	High.	
	Acres.	*Tons.*[1]	*Tons.*[1]	*Dolls.*	*Dollars.*	*Dolls.*	*Dolls.*	*Dolls.*	*Dolls.*	*Tons.*[2]
1849	....	....	*13,839,000*	....	....	....	....	....	....	....
1859	....	....	*19,084,000*	....	....	....	....	....	....	....
1866	17,669,000	1.23	21,779,000	10.14	220,836,000	....	....	....	....	5,02
1867	20,021,000	1.31	26,277,000	10.21	268,301,000	....	....	....	....	5,64
1868	21,542,000	1.21	26,142,000	10.08	263,589,000	....	....	....	....	....
1869	18,591,000	1.42	26,420,000	10.18	268,933,000	....	....	....	....	6,72
1869	....	....	*27,316,000*	....	....	....	....	....	....	....
1870	19,862,000	1.23	24,525,000	12.47	305,743,000	....	....	....	....	4,55
1871	19,009,000	1.17	22,239,000	14.30	317,940,000	....	....	....	....	5,20
1872	20,319,000	1.17	23,813,000	12.94	308,025,000	....	....	....	....	4,55
1873	21,894,000	1.15	25,085,000	12.53	314,241,000	....	....	....	....	4,85
1874	21,770,000	1.15	25,134,000	11.94	300,222,000	....	....	....	....	7,12
1875	23,508,000	1.19	27,874,000	10.78	300,378,000	....	....	....	....	7,52
1876	25,283,000	1.22	30,867,000	8.97	276,991,000	....	....	9.00	10.00	7,20
1877	25,368,000	1.25	31,629,000	8.37	264,880,000	9.50	10.50	9.75	10.75	9,51
1878	26,931,000	1.47	39,608,000	7.20	285,016,000	8.00	8.50	9.00	11.50	8,12
1879	27,485,000	1.29	35,493,000	9.32	330,804,000	14.00	14.50	14.00	15.00	13,73
1879	*30,631,000*	*1.15*	*35,151,000*	....	....	....	....	....	....	....
1880	25,864,000	1.23	31,925,000	11.65	371,811,000	15.00	15.50	17.00	19.00	12,00
1881	30,889,000	1.14	35,135,000	11.82	415,131,000	16.00	16.50	15.00	16.50	10,57
1882	32,340,000	1.18	38,138,000	9.73	371,170,000	11.50	12.25	12.00	13.00	13,30
1883	35,516,000	1.32	46,864,000	8.19	383,834,000	9.00	10.00	12.50	17.00	16,90
1884	38,572,000	1.26	48,470,000	8.17	396,139,000	10.00	11.50	15.50	17.50	11,14
1885	39,850,000	1.12	44,732,000	8.71	389,753,000	11.00	12.00	10.00	12.00	12,30
1886	36,502,000	1.15	41,796,000	8.46	353,438,000	9.50	10.50	11.00	12.50	13,83
1887	37,665,000	1.10	41,454,000	9.97	413,440,000	13.50	14.50	17.00	21.00	18,11
1888	38,592,000	1.21	46,643,000	8.76	408,500,000	11.00	11.50	10.50	21.00	21,9
1889	52,949,000	1.26	66,831,000	7.04	470,394,000	9.00	10.00	9.00	14.00	26,2
1889	*52,949,000*	*1.26*	*66,831,000*	....	....	....	....	....	....	....

[1] 2,000 pounds. [2] 2,240 pounds.

HAY—Continued.

TABLE 69.—*Acreage, production, value, and exports of hay, United States, 1849–1913*—Continued.

[1] 2,000 pounds. [2] 2,240 pounds. [3] Figures adjusted to census basis.

TABLE 70.—*Acreage, production, and value of hay, by States, 1913.*

(000 omitted.)

...ate.	Acreage.	Production.	Farm value, Dec. 1.
	Acres.	*Tons.*	*Dollars.*
...ta	340	368	2,260
...ta	460	552	3,588
	1,250	1,675	14,572
	1,500	1,350	16,875
	775	674	11,121
	900	1,089	17,642
	210	286	4,061
	220	293	3,956
	160	240	3,000
	400	464	5,475
	450	382	3,973
	320	384	5,184
	660	1,188	11,405
	480	912	6,110
	890	1,824	18,240
	192	399	4,828
	135	540	5,940
	390	909	8,272
	235	646	7,106
	705	2,044	14,717
	780	1,794	19,555
	825	1,732	15,588
	2,400	3,600	48,600
...d States	48,954	64,116	797,077

HAY—Continued.

TABLE 71.—*Yield per acre, price per ton, and value per acre of hay, by States.*

State.	Yield (tons) per acre: 10-year averages: 1870–1879	1880–1889	1890–1899	1900–1909	1910	1911	1912	1913	Farm price (dollars) per ton: 10-year averages for Dec. 1: 1870–1879	1880–1889	1890–1899	1900–1909	Dec. 1, 1910.	Dec. 1, 1911.	Dec. 1, 1912.	Dec. 1, 1913.	Value (dollars) per acre, 1913.[1]
Me.	0.90	0.96	0.99	1.07	1.25	1.10	1.16	1.00	12.64	11.56	10.05	11.47	12.80	14.40	13.70	13.90	13.90
N. H.	1.01	.94	1.01	1.07	1.20	1.05	1.25	1.00	12.94	11.72	11.80	14.34	15.80	17.20	15.00	17.20	17.20
Vt.	1.06	1.07	1.22	1.28	1.35	1.30	1.50	1.28	10.85	10.32	9.56	11.13	12.40	14.00	14.00	14.50	18.56
Mass.	1.13	1.10	1.20	1.27	1.28	1.08	1.25	1.21	18.81	17.02	15.43	17.11	19.10	23.00	21.50	21.10	25.53
R. I.	1.05	.99	.97	1.12	1.18	1.00	1.13	1.17	22.02	16.72	16.18	18.15	19.60	24.10	22.20	21.20	24.80
Conn.	1.21	1.01	1.03	1.14	1.35	1.10	1.15	1.14	18.89	15.87	14.83	15.88	19.00	23.50	22.50	20.10	22.91
N. Y.	1.20	1.13	1.12	1.22	1.32	1.02	1.25	1.14	12.68	12.02	10.09	12.10	13.70	17.90	14.90	15.30	17.44
N. J.	1.24	1.13	1.19	1.32	1.50	1.05	1.44	1.30	17.72	15.11	13.32	15.43	18.20	22.00	20.00	19.00	24.70
Pa.	1.19	1.15	1.19	1.32	1.38	1.00	1.43	1.32	13.88	12.11	10.85	13.45	15.00	20.00	15.60	14.90	19.67
Del.	1.06	1.07	1.14	1.36	1.43	.88	1.33	1.30	17.60	14.16	12.16	14.31	14.80	22.50	15.00	15.70	20.41
Md.	1.11	1.09	1.12	1.27	1.35	.72	1.51	1.26	16.52	13.44	11.35	13.56	15.40	22.40	14.40	15.20	19.15
Va.	1.18	1.11	1.09	1.27	1.19	.64	1.20	1.27	14.20	12.41	10.88	13.46	14.50	20.50	15.20	15.50	19.68
W. Va.	1.14	1.03	1.16	1.36	1.20	.66	1.38	1.25	11.19	10.22	10.08	13.32	15.00	20.00	15.00	14.90	18.62
N. C.	1.28	1.16	1.41	1.54	1.50	1.05	1.30	1.31	11.06	11.66	10.55	13.44	14.60	17.00	16.70	16.50	21.62
S. C.	1.05	1.12	1.30	1.38	1.25	1.08	1.15	1.16	18.11	13.76	10.71	13.30	16.00	17.00	18.00	18.70	21.69
Ga.	1.37	1.24	1.39	1.56	1.40	1.35	1.35	1.40	17.53	13.93	12.38	15.04	16.40	17.00	17.00	17.90	25.06
Fla.	.....	1.07	1.38	1.38	1.33	1.30	1.25	1.35	.....	16.28	15.04	15.99	17.00	18.50	18.10	18.20	24.57
Ohio	1.17	1.22	1.22	1.38	1.39	.98	1.36	1.30	10.69	10.35	8.52	10.06	12.50	18.90	13.00	12.80	16.64
Ind.	1.25	1.28	1.24	1.36	1.30	.94	1.37	1.00	9.61	9.03	7.89	9.62	11.90	16.80	11.40	14.10	14.10
Ill.	1.34	1.31	1.23	1.35	1.33	.82	1.30	.98	7.94	8.02	7.65	9.53	12.00	17.00	12.60	14.10	13.82
Mich.	1.20	1.24	1.21	1.34	1.30	1.16	1.33	1.05	11.46	10.65	9.06	9.51	13.60	17.00	12.70	13.10	13.76
Wis.	1.36	1.19	1.29	1.56	1.00	1.20	1.60	1.62	8.28	8.87	7.43	8.88	15.10	15.60	12.10	11.10	17.98
Minn.	1.43	1.31	1.44	1.66	1.00	1.00	1.53	1.50	5.02	5.20	4.67	6.02	9.10	11.90	6.40	6.60	9.90
Iowa	1.42	1.26	1.34	1.55	1.05	.80	1.40	1.48	5.17	5.29	5.51	6.47	9.60	12.50	9.50	9.60	14.21
Mo.	1.32	1.21	1.23	1.28	1.30	.60	1.30	.60	8.88	7.80	6.49	8.15	9.20	13.30	9.80	14.50	8.70
N. Dak.	.....	1.27	1.35	1.39	.55	1.10	1.40	1.14	.....	4.05	3.69	4.70	7.60	7.00	5.50	5.80	6.61
S. Dak.	.....	1.28	1.18	1.39	.80	.55	1.46	1.20	.....	4.05	3.55	4.47	7.10	8.50	6.10	6.50	7.80
Nebr.	1.52	1.31	1.26	1.55	1.00	.85	1.35	1.34	3.74	3.67	4.05	5.09	8.90	9.70	8.40	8.70	11.66
Kans.	1.46	1.26	1.23	1.41	1.15	.85	1.50	.90	3.92	4.41	3.92	5.63	7.80	9.90	7.60	12.50	11.25
Ky.	1.25	1.17	1.26	1.38	1.29	.95	1.23	.87	11.73	10.88	9.92	11.86	13.10	17.30	13.70	16.50	14.36
Tenn.	1.32	1.22	1.31	1.52	1.40	1.00	1.30	1.21	13.54	11.66	10.57	12.48	13.40	16.70	15.80	16.20	19.60
Ala.	1.32	1.22	1.60	1.73	1.43	1.40	1.25	1.36	15.99	13.65	10.83	12.58	13.20	12.80	14.60	14.20	19.31
Miss.	1.41	1.26	1.56	1.65	1.42	1.50	1.48	1.33	17.36	12.95	9.81	11.13	12.20	11.00	12.50	13.50	17.96
La.	1.34	1.24	1.74	1.89	1.75	1.30	1.65	1.50	19.50	12.07	9.75	11.54	11.50	12.00	12.70	12.50	18.75
Tex.	1.32	1.26	1.25	1.57	1.15	1.00	1.40	1.16	12.23	9.88	7.79	8.99	12.00	11.90	10.40	11.80	13.69
Okla.	.....	.....	.....	1.30	1.05	.80	1.25	.85	.....	.....	.....	5.65	8.40	8.00	7.40	10.40	8.54
Ark.	1.39	1.24	1.27	1.50	1.35	1.15	1.23	1.20	14.33	11.48	8.87	10.11	11.00	13.00	12.00	13.50	16.20
Mont.	.....	1.11	1.26	1.80	1.40	2.00	1.90	1.80	.....	10.96	8.35	8.64	12.50	10.00	8.30	9.60	17.28
Wyo.	[2]1.45	1.15	1.40	2.08	2.40	2.10	1.90	1.90	[2]12.98	10.66	7.33	7.19	12.50	10.30	8.60	6.70	12.73
Colo.	.....	1.23	1.99	2.35	2.00	2.00	2.19	2.05	.....	13.58	6.84	8.67	10.80	9.30	8.70	10.00	20.30
N. Mex.	.....	1.18	2.20	2.36	2.10	2.60	2.33	2.08	.....	12.52	8.84	10.78	11.50	13.00	8.50	12.10	25.17
Ariz.	.....	1.20	2.14	3.03	2.10	3.86	3.40	4.00	.....	12.83	9.17	12.13	13.00	12.00	12.00	11.00	44.00
Utah	.....	1.36	2.24	2.90	3.00	2.50	2.78	2.33	.....	7.00	5.72	7.44	9.00	9.00	8.00	9.10	21.20
Nev.	1.40	1.33	2.34	2.41	3.40	3.40	3.00	2.75	19.57	11.03	7.02	8.80	10.80	9.50	8.70	11.00	30.25
Idaho	.....	1.23	2.23	2.85	3.00	3.10	2.80	2.90	.....	9.36	6.23	6.94	9.00	7.60	6.30	7.20	20.88
Wash.	.....	1.32	1.77	2.28	2.10	2.40	2.20	2.30	.....	9.95	8.74	11.17	15.70	12.00	10.10	10.90	25.07
Oreg.	1.51	1.43	1.77	2.11	2.10	2.10	2.20	2.10	12.51	10.68	7.54	8.86	12.10	9.60	8.30	9.00	18.90
Cal.	1.44	1.42	1.61	1.83	1.83	1.75	1.53	1.50	15.15	11.32	9.23	10.61	9.60	10.90	13.70	13.50	20.25
U. S.	1.23	1.20	1.28	1.44	1.36	1.14	1.47	1.31	10.88	9.25	7.62	9.59	12.14	14.29	11.79	12.43	16.28

[1] Basis, Dec. 1 price.

[2] The Territories.

HAY—Continued.

TABLE 72.—*Farm price of hay per ton on first of each month, by geographical divisions, 1912 and 1913.*

TABLE 73.—*Wholesale price of hay (baled) per ton, 1899–1913.*

Date.	Chicago.		Cincinnati.		St. Louis.		New York.	
	No. 1 timothy.		No. 1 timothy		No. 1 timothy.		No. 1 timothy.[1]	
	Low.	High.	Low.	High.	Low.	High.	Low.	High.
1899	$7 50	$13.00	$7.75	$13.00	$8.00	$12.00	$0.65	$0.95
1900	10.00	14.00	11.50	15.00	9.75	14.50	.87½	.97½
1901	11 50	15.00	11 50	15 50	11 50	17 50	87½	1 00
1902	10 00	17 50	11.00	16.50	9.50	16.00	17.00	22.00
1903	10.00	15.00	11.50	19.50	9.50	25.00	16.00	26.00
1904	9.00	15.00	11.00	15.50	10.00	13.50	15.00	19.00
1905	10.00	12.50	10.00	13.50	9.00	15.50	14.00	19.00
1906	9.50	18.00	11.00	19.50	11 00	20.00	15.00	23.00
1907	13.00	21 50	14 00	22.75	14 00	24 00	1 00	1 25
1908	10.00	14.00	11.50	16.50	10.00	18.00	14 00	21.00
1909	11 00	17 00	12.00	17 25	11 50	18.50	15.50	21.00
1910	12.50	21 00	17 00	22.50	16.00	20.50	21.00	28.00
1911	15.00	25.00	18.00	28.50	14 50	29 00	20.50	30.00
1912	13.00	28.00	15.50	31 00	13.00	31 00	21 50	32.00
1913.								
January	13.00	18.50	16.00	18.50	14 00	18.00	19.50	22.00
February	13.50	15.00	14.00	17 50	12.00	17 00	19.50	21 00
March	13 00	16.50	14.50	17 00	12.50	18.00	20.00	21.00
April	14 00	17 00	16.50	19.00	14 00	18.00	20.00	21 50
May	14 00	16.50	15.00	19.00	14 00	18.50	20.50	23.00
June	13.50	15.00	14.00	15.50	14.00	17.00	20.00	21.00
July	13.50	17 50	15.25	20.00	13.50	18.00	20.00	21.00
August	16.50	19.00	16.00	20.00	15.00	20.00	21.00	22.00
September	16.00	19.50	18.50	21.00	16.00	21 00	20.50	22.00
October	16 50	19.50	18.50	21 00	17 00	23.50	20.50	22.00
November	16 50	17 50	18.50	19.50	17 00	22 50	21.00	21.50
December	14 50	18 00	17 75	19.50	16.00	24 00	20.50	21.50
Year	13.00	19.50	14.00	21 00	12.00	24.00	19.50	23.00

[1] Per hundred pounds, 1899 to 1901, and 1907

CLOVER AND TIMOTHY SEED.

TABLE 74.—*Wholesale price of clover and timothy seed, 1899–1913.*

Date.	Clover (bushel) Cincinnati. Prime.	Clover (bushel) Chicago. Poor to prime.[1]	Timothy.
1899			
1900			
1901			
1902			40
1903			60
1904			60
1905			70
1906			00
1907			60
1908			50
1909			70
1910			50
1911			75
1912			50
1913.			
January			60
February			75
March			.35
April			35
May			.50
June			.00
July			.35
August			50
September			.35
October			.30
November			.25
December			.35
Year	5.00 11.50 4 20		.50

[1] Poor to choice, 1899 to 1904.

[2] Prime, 1902 to 1904.

COTTON.

TABLE 75.—*Cotton crop of countries named, 1908–1912.*

[Bales of 478 pounds net.]

Country.	1908	1909	1910	1911	1912
NORTH AMERICA.					
United States: [1]	*Bales.*	*Bales.*	*Bales.*	*Bales.*	*Bales.*
Contiguous	13,241,799	10,004,949	11,608,616	15,692,701	13,703,421
Noncontiguous—Porto Rico	399	240	342	412	447
Total United States (except Philippine Islands)	13,242,198	10,005,189	11,608,958	15,693,113	13,703,868
Mexico [2]	[3] 269,713	[3] 269,713	200,455	200,455	200,455
West Indies:					
British—					
Bahamas [4]	27	25	13	27	[5] 28
Barbados [4]	2,061	1,348	1,348	1,520	[5] 953
Grenada [4]	489	677	555	574	[5] 796
Jamaica [4]	43	46	28	37	[5] 76
Leeward Islands	[4] 2,248	1,443	1,892	3,088	[5] 2,242
St. Lucia [4]	....	13	37	8	[5] 7
St. Vincent [4]	880	733	1,092	1,125	[5] 946
Trinidad and Tobago	28	18	24	13	[3] 13
Danish [4]	505	455	506	519	548
French: Guadeloupe [4]	26	12	12	8	8
Haiti [4]	[3] 7,092	7,550	7,867	10,997	9,113
Total	13,525,310	10,287,222	11,822,787	15,911,484	13,919,053
SOUTH AMERICA.					
Argentina	[7] 2,000	[6] 2,000	[6] 2,000	18,449	18,449
Brazil [2]	231,000	265,000	270,000	[3] 270,000	[3] 270,000
Chile [4]	979	788	708	636	905
Colombia and Venezuela [7]	5,000	5,000	5,000	5,000	5,000
Ecuador [4]	15	49	316	184	[3] 184
Peru	73,884	98,262	65,059	72,813	88,694
Paraguay [8]	200	200	200	200	200
Total	313,078	371,299	343,283	367,282	383,432
EUROPE.					
Bulgaria	691	783	1,137	917	[3] 917
Crete [7]	700	700	700	700	700
Greece	[8] 8,200	[8] 8,200	32,285	[2] 23,615	[3] 23,615
Italy	2,700	2,700	2,700	2,700	2,700
Malta	364	379	411	392	[5] 975
Turkey, European [8]	[9] 10,000	10,000	[9] 10,000	[9] 10,000	[9] 10,000
Total	22,655	22,762	47,233	38,324	38,907
ASIA.					
British India, including native States [10]	3,514,728	4,123,849	3,600,837	2,751,464	[5] 3,677,824
Ceylon [4]	492	404	537	710	[5] 1,490
China [7]	4,000,000	4,000,000	4,000,000	4,000,000	4,000,000
Chosen (Korea)	[7] 70,000	[7] 70,000	35,994	63,450	85,465
Cyprus	3,860	3,436	5,102	7,230	[5] 7,632
Dutch East Indies [4]	19,932	13,235	14,504	11,902	[3] 11,902
French Indo-China [4]	20,968	14,138	9,451	8,709	[3] 8,709
Japan	6,437	5,630	4,158	4,215	[3] 4,215
Persia [4]	83,985	128,031	123,277	85,878	128,709
Philippine Islands [11]	6,098	6,098	6,098	6,098	6,098

[1] "Linters," a by-product obtained in the oil mills, not included. Quantity of linters produced as follows: 265,282 bales in 1907, 343,507 in 1908, 310,433 in 1909, 397,628 in 1910, 556,276 in 1911, and 602,324 in 1912. For Porto Rico data refer to exports to foreign countries, plus shipments to the United States.

[2] Unofficial estimate.

[3] Year preceding.

[4] Exports.

[5] Preliminary.

[6] Data for 1908.

[7] Average production as unofficially estimated.

[8] Data for European and Asiatic Turkey include 29 provinces and arrondissements only.

[9] Data for 1909.

[10] Net exports and consumption.

[11] Census, 1902.

COTTON—Continued.

TABLE 75.—*Cotton crop of countries named, 1908–1912*—Continued.

Country.	1908	1909	1910	1911	1912
ASIA—continued.					
Russia, Asiatic:	*Bales.*	*Bales.*	*Bales.*	*Bales.*	*Bales.*
Central Asia [1]	494,000	372,000	641,884	585,959	596,468
Transcaucasia	37,541	45,861	48,669	107,205	70,110
Total, Asiatic Russia	531,541	417,861	690,553	693,164	666,578
Siam	281	....	....	....	4,363
Turkey, Asiatic [2]	[5] 131,000	131,000	[3] 131,000	[3] 131,000	[3] 131,000
Total	8,389,322	8,913,682	8,621,511	7,763,820	8,733,985
AFRICA.					
British Africa:					
Nyasaland Protectorate [4]	1,582	1,729	3,634	2,845	[5] 6,773
East Africa	526	297	341	347	[5] 910
Gold Coast [4]	108	65	24	20	[5] 43
Nigeria	4,800	10,529	5,185	4,682	[5] 9,148
Uganda [4]	3,401	5,429	19,442	17,456	[5] 21,986
Union of South Africa [4]	82	159	104	74	[5] 67
Total, British Africa	10,499	18,208	28,730	25,424	38,927
Egypt	1,398,125	1,045,724	1,548,713	1,514,730	1,554,100
French Africa: [4]					
Algeria	163	200	124	761	825
Dahomey	342	600	556	623	[6] 577
Madagascar	4	2	....	7	[6] 16
Senegal	75	6	39	8	[6] 92
Upper Senegal and Niger	62	96	89	99	[6] 461
Somali Coast	3	7	24	5	[7] 5
Total, French Africa	649	911	832	1,503	1,976
German Africa: [4]					
East Africa	1,246	2,395	2,872	4,983	8,678
Kamerun	11	11	[3] 11	[3] 11	[3] 11
Togo	1,933	2,356	2,142	2,387	2,541
Total, German Africa	3,190	4,762	5,025	7,381	11,230
Italian Africa—Eritrea	890	636	[8] 770	[8] 1,307	[8] 1,247
Belgian Kongo [4]	1	....	1	1	....
Portuguese Africa:					
Angola [9]	241	420	536	509	[7] 509
East Africa	....	48	91	21	[7] 21
Total, Portuguese Africa	241	468	627	530	530
Sudan (Anglo-Egyptian)	24,170	13,222	[8] 13,230	17,392	12,128
Total	1,437,765	1,083,931	1,597,928	1,568,268	1,620,138
OCEANIA.					
British: Queensland	82	90	106	130	[5] 105
Fiji Islands [4]	7	....	4	....	....
French: [4]					
New Caledonia	3	16	56	209	[6] 923
French Establishments	70	332	361	127	[7] 127
Total	162	438	527	466	1,155
Grand total	23,688,292	20,679,334	22,433,269	25,649,644	24,696,670

[1] Not including Khiva and Bokhara.
[2] Data for European and Asiatic Turkey include 29 provinces and arrondissements only.
[3] Data for 1909.
[4] Exports.
[5] Preliminary.
[6] Production. Preliminary.
[7] Year preceding.
[8] Imports from Eritrea into Italy.
[9] Imports from Angola into Portugal.

COTTON—Continued.

TABLE 76.—*Total production of cotton in countries named in Table 75, 1900–1912.*

Year.	Production.	Year.	Production.	Year.	Production.	Year.	Production.
	Bales.[1]		*Bales.*[1]		*Bales.*[1]		*Bales.*[1]
1900	15,893,591	1904	21,005,175	1907	18,328,613	1910	22,433,269
1901	15,926,048	1905	18,342,075	1908	3,688,292	1911	25,649,644
1902	17,331,503	1906	22,183,148	1909	20,679,334	1912	24,696,767
1903	17,278,881						

[1] Bales of 478 pounds lint, net.

TABLE 77.—*Cotton acreage (harvested), by States, 1904–1913.*

[Thousand acres.]

State.	1904	1905	1906	1907	1908	1909	1910	1911	1912	1913
Virginia	38	35	36	23	28	25	33	43	47	47
North Carolina	1,439	1,230	1,374	1,408	1,458	1,359	1,478	1,624	1,545	1,576
South Carolina	2,556	2,340	2,389	2,485	2,545	2,492	2,534	2,800	2,695	2,790
Georgia	4,397	4,020	4,610	4,566	4,848	4,674	4,873	5,504	5,335	5,318
Florida	272	230	283	209	265	237	257	308	224	188
Alabama	3,804	3,425	3,659	3,148	3,591	3,471	3,560	4,017	3,730	3,760
Mississippi	3,911	3,019	3,408	3,081	3,395	3,291	3,317	3,340	2,889	3,067
Louisiana	1,967	1,445	1,740	1,540	1,550	930	975	1,075	929	1,244
Texas	8,233	7,432	8,894	8,478	9,316	9,660	10,060	10,943	11,338	12,597
Arkansas	2,173	1,723	2,098	1,902	2,296	2,218	2,238	2,363	1,991	2,502
Tennessee	780	629	814	693	754	735	765	837	783	865
Missouri	92	70	91	63	87	79	100	129	103	112
Olahoma	1,553	1,509	1,982	2,064	2,311	1,767	2,204	3,050	2,665	3,009
California	......	......	......	......	......	......	9	12	9	14
United States	31,215	27,107	31,378	29,660	32,444	30,938	32,403	36,045	34,283	37,089

TABLE 78.—*Production of lint cotton (excluding linters) in 500-pound gross weight bales, by States, and total value of crop, 1904 to 1913.*

[Thousand bales. As finally reported by U. S. Bureau of the Census.]

State.	1904	1905	1906	1907	1908	1909	1910	1911	1912	1913
Virginia	16	15	14	9	12	10	15	30	24	23
North Carolina	704	619	579	605	647	601	706	1,076	866	790
South Carolina	1,151	1,078	876	1,119	1,171	1,100	1,164	1,649	1,182	1,374
Georgia	1,888	1,682	1,593	1,816	1,931	1,804	1,767	2,769	1,777	2,316
Florida	79	69	56	50	62	54	59	83	53	58
Alabama	1,448	1,239	1,262	1,113	1,346	1,024	1,194	1,716	1,342	1,494
Mississippi	1,798	1,199	1,531	1,468	1,656	1,083	1,263	1,204	1,046	1,307
Louisiana	1,090	513	988	676	470	253	246	385	376	442
Texas	3,146	2,542	4,174	2,300	3,815	2,523	3,049	4,256	4,880	3,943
Arkansas	931	619	941	775	1,033	714	821	939	792	1,071
Tennessee	329	279	306	275	344	247	332	450	277	379
Missouri	52	43	54	36	62	45	60	97	56	67
Oklahoma	804	677	898	862	691	545	923	1,022	1,021	830
All other	2	1	2	3	2	2	10	17	11	23
United States	13,438	10,575	13,274	11,107	13,242	10,005	11,609	15,693	13,703	14,116
Total value of crop	$561,100	$556,830	$640,310	$613,630	$588,810	$688,350	$820,320	$732,420	$792,240	....

COTTON—Continued.

BLE 81.—*Farm price of cotton per pound on first of each month, by geographical divisions, 1912 and 1913.*

Month.	United States.		South Atlantic States.		N. Cent. States West of Miss. R.		South Central States.		Far Western States.	
	1913	1912	1913	1912	1913	1912	1913	1912	1913	1912
	Cts.	*Cts.*	*Cts.*	*Cts.*	*Cts.*	*Cts.*	*Cts.*	*Cts.*	*Cts.*	*Cts.*
uary	12.2	8.4	12.6	8.3	11.0	....	12.1	8.4	....	8.0
ruary	11.9	9.0	12.1	9.0	12.0	8.7	11.8	9.1	....	9.0
rch	11.8	9.8	11.9	9.8	9.0	....	11.7	9.7	12.0	....
ril	11.8	10.1	12.0	10.3	9.5	9.0	11.8	10.1	12.5	....
y	11.6	10.9	11.6	11.1	9.5	....	11.6	10.8	....	....
ne	11.5	11.0	11.6	11.2	9.0	9.2	11.4	10.9	....	....
y	11.6	11.2	11.9	11.5	9.3	10.3	11.5	11.1	....	....
gust	11.5	12.0	11.8	12.3	9.1	11.3	11.4	11.9	....	....
ptember	11.8	11.3	11.8	11.5	11.5	9.2	11.8	11.2	....	....
tober	13.3	11.2	13.3	11.2	13.0	11.3	13.3	11.2	....	10.8
vember	13.0	10.9	13.5	10.9	11.5	9.0	12.8	10.9	....	....
cember	12.2	11.9	12.8	12.4	11.5	11.3	11.9	11.7	13.0	12.5

TABLE 82.—*Closing price of middling upland cotton per pound, 1899–1913.*

Date.	New York.		New Orleans.		Memphis.		Galveston.		Savannah.		Charleston.	
	Low.	High.	Low.	High.	Low.	High.	Low.	High.	Low.	High.	Low.	High.
9	6¼	7 11/16	5 3/16	7½	5⅝	7½	5 7/16	7½	5 5/16	7 5/16	5⅛	7⅜
0	7¼	11	7¼	11⅜	7⅜	11	7¼	10	7 5/16	10¾	7¼	10¾
1	7	12	7¼	9 11/16	7⅛	9⅝	7⅜	9 11/16	7⅜	9⅝	7⅛	9⅝
2	8 3/16	9⅞	7⅜	9¾	7	9½	7¼	9⅝	7 3/16	9 5/16	7 3/16	9⅝
3	8.85	14.10	8 7/16	13⅝	8½	13½	8⅝	13⅝	8⅜	13⅜	8¼	13½
4	6.85	17.25	6½	16 7/16	6¾	16½	6⅝	16	6½	16¼	6½	16
5	7.00	12.60	6⅝	12 1/16	6¾	12⅛	6¾	12	6⅝	11 11/16	6⅝	11 5/16
6	9.60	12.25	9⅜	11 11/16	9⅜	11 11/16	9¼	11 3/16	8⅞	11¾	8¾	11⅝
7	10.60	13.55	10¼	13 3/16	10¼	13½	10½	13 3/16	9⅞	13 5/16	9¾	13
8	9.00	12.25	8 11/16	12¼	8¾	12⅝	8¾	12¼	8¼	11⅝	8¼	11⅝
9	9.25	16.15	8⅞	15¾	9	15⅝	9	15⅜	8 11/16	15⅞	8¾	15 5/16
0	13.60	19.75	13¼	15¼	13½	15⅝	13⅜	15⅞	13 3/16	15⅝	13	15⅝
1	9.20	16.15	9 1/16	15 11/16	9¼	15 7/16	9¼	15⅝	8⅝	15½	8¾	15⅝
2	9.35	13.40	9 3/16	13¼	9 7/16	13¼	9⅜	13 5/16	8⅝	12¾	8¾	12¾
1913.												
uary	12.85	13.40	12¼	13	12⅝	13⅛	12½	13	12 5/16	12¾	12¼	12⅝
ruary	12.50	13.05	12⅜	12¾	12½	12¾	12½	12⅞	12¾	12 9/16	12¼	12½
rch	12.40	12.90	12⅝	12½	12⅜	12⅝	12½	12 11/16	12¼	12⅝	12⅛	12 5/16
ril	11.70	12.60	12 3/16	12 9/16	12¼	12½	12⅝	12¾	12	12⅝	11⅞	12⅝
y	11.80	12.10	12⅛	12 7/16	12⅛	12⅝	12	12 5/16	11⅞	12⅛	11⅞	11⅞
e	11.70	12.50	12 3/16	12⅜	12	12¼	12	12⅜	12⅛	12⅜	11⅞	11⅞
y	11.95	12.45	11 15/16	12⅜	12	12⅜	11 15/16	12⅜	11⅞	12	....	....
gust	11.90	12.70	11⅞	12 5/16	11¾	12⅝	11¾	12½	11¼	12⅝	....	....
tember	12.75	14.30	12 7/16	13 15/16	12⅝	13¾	12¾	14⅜	12¼	13¾	12⅜	12⅞
ober	13.50	14.50	13¼	14	13⅝	13¾	13⅝	14⅝	12¾	14⅛	12⅞	13⅞
vember	13.30	14.10	12 15/16	13¾	13¼	13¾	13¼	13⅜	13	13½	13	13 9/16
ember	12.50	13.50	12 9/16	13 3/16	13⅛	13¼	12¾	13⅜	12⅜	13⅛	12⅜	13⅛
Year	11.79	14.50	11⅞	14	11¾	13¾	11¾	14⅜	11¼	14⅛	11¾	13⅞

COTTON—Continued.

TABLE 83.—*International trade in cotton, calendar years 1910–1912.*

[Expressed in bales of 500 pounds gross weight, or 478 pounds of lint net.]

[The figures for cotton refer to ginned and unginned cotton and linters, but not to mill waste, cotton ba[tting], *scarto* (Egypt and Sudan). Wherever unginned cotton has been separately stated in the origin[al] reports it has been reduced to ginned cotton in this statement at the ratio of 3 pounds unginned to 1 poun[d] ginned. See "General note," p. 375.]

EXPORTS.

[000 omitted.]

Country.	1910	1911	1912	Country.	1910	1911	1912
	Bales.	*Bales.*	*Bales.*		*Bales.*	*Bales.*	*Bal[es].*
Belgium	....	255	242	Netherlands	141	137	16
Brazil	51	68	77	Persia[1]	[2]128	86	12
British India	2,381	1,742	1,689	Peru	65	73	8
China	548	245	225	United States	7,290	8,920	11,15
Egypt	1,243	1,373	172	Other countries	138	151	[3]17
France	411	305	325				
Germany	231	186	247	Total	12,427	13,541	14,67

IMPORTS.

Country.	1910	1911	1912	Country.	1910	1911	1912
Austria-Hungary	784	907	1,021	Russia	911	935	67
Belgium	290	583	652	Spain	335	417	42
Canada	139	157	165	Sweden	95	92	[4]9
France	1,120	1,469	1,597	Switzerland	97	113	12
Germany	1,968	2,180	2,502	United Kingdom	3,591	4,008	5,19
Italy	805	876	987	United States	178	212	27
Japan	1,350	1,125	1,655	Other countries	292	308	[3]32
Mexico	11	6	18				
Netherlands	234	270	324	Total	12,200	13,658	16,2

[1] Year beginning Mar. 21.
[2] Data for 1909.
[3] Preliminary.
[4] Year preceding.

COTTONSEED OIL.

TABLE 84.—*International trade in cottonseed oil, calendar years 1910–1912.*

[See "General note," p. 375]

EXPORTS.

[000 omitted.]

Country.	1910	1911	1912	Country.	1910	1911	1912
	Gallons.	*Gallons.*	*Gallons.*		*Gallons.*	*Gallons.*	*Gallon[s].*
Belgium	936	1,042	1,341	United States	23,559	43,004	47,45
Egypt	515	488	[1]488	Other countries	69	6	[2]3
France	278	177	172				
Netherlands	103	43	40	Total	34,394	51,542	55,62
United Kingdom	8,934	6,782	6,099				

IMPORTS.

Country.	1910	1911	1912	Country.	1910	1911	1912
Algeria	128	[1]128	118	Mexico	3,693	673	4,31
Australia	113	119	182	Netherlands	3,971	3 544	7,04
Austria-Hungary	6	15	17	Norway	1,443	1,492	1,55
Belgium	1,831	2,337	2,876	Roumania	302	805	[1]90
Brazil	670	[1]670	[3]670	Senegal	402	464	[1]46
Canada	3,128	1,830	2,911	Servia	207	396	[1]39
Egypt	146	186	[1]186	Sweden	607	680	[1]68
France	1,055	2,609	3,697	United Kingdom	4,665	7,361	7,58
Germany	5,419	6,391	7,900	Uruguay[5]	383	[1]383	[3]3
Italy	1,052	3,599	5,388	Other countries	2,254	4,146	[2]4,8
Malta[4]	234	261	[1]261				
Martinique	324	275	[1]275	Total	32,033	38,364	52,5

[1] Year preceding.
[2] Preliminary.
[3] Data for 1910.
[4] Year beginning Apr. 1.
[5] Year beginning July 1.

TOBACCO.

Table 85.—*Tobacco crop of countrie: named, 1910–1912.*

[000 omitted]

Country.	1910	1911	1912
ASIA.	*Pounds*	*Pounds*	*Pounds*
British India [1]	450,000	450,000	450,000
British North Borneo [7]	2,663	2,650	[6] 2,650
China: Hu-nan and Kiang-si [3]	18,016	18,016	18,016
Dutch East Indies:			
Java [10]	116,000	117,741	134,143
Sumatra, East Coast of	43,071	46,492	48,284
Total Dutch East Indies.	159,071	164,233	182,427
Formosa	1,726	[9] 1,726	[9] 1,726
Japan	93,988	74,896	93,696
Philippine Islands	56,257	[6] 56,257	65,219
Russia, Asiatic	34,873	31,533	28,791
Total	816,594	799,311	842,525
AFRICA.			
Algeria	21,209	24,443	[9] 24,443
Mauritius	27	[9] 27	[9] 27
Nyasaland	1,743	1,949	3,391
Rhodesia	[11] 147	606	[6] 606
Tunis	289	[9] 289	[9] 289
Union of South Africa [12]			
Cape of Good Hope	3,767	3,767	3,767
Natal	2,685	2,685	2,685
Orange River Colony	807	807	807
Transvaal	7,702	7,702	7,702
Total Union of S. Africa.	14,961	14,961	14,961
Total	38,436	42,275	43,717
OCEANIA.			
Australia.			
Queensland	450	849	477
New South Wales	728	953	1,685
Victoria	307	122	262
Total Australia	1,485	1,924	2,424
Fiji	24	59	[9] 59
Total	1,509	1,983	2,483
Grand total	2,833,729	2,663,525	2,835,740

[1] Unofficial estimate.
[2] Census of 1911 giving crops of 1910.
[3] Average production unofficially estimated.
[4] Data for 1907.
[5] Data for 1906.
[6] Year preceding.
[7] Exports.
[8] Data for 1909.
[9] Data for 1910.
[10] Exports. Official returns for production are less than exports.
[11] Data for 1904.
[12] Census of 1911.

TOBACCO—Continued.

TABLE 86.—*Total production of tobacco in countries named in Table 85, 1900-1912.*

Year.	Production.	Year.	Production.	Year.	Production.	Year.	Production.
	Pounds.		*Pounds.*		*Pounds.*		*Pounds.*
1900	2,201,193,000	1904	2,146,641,000	1907	2,391,061,000	1910	2,833,729,000
1901	2,270,213,000	1905	2,279,728,000	1908	2,382,601,000	1911	2,663,525,000
1902	2,376,054,000	1906	2,270,298,000	1909	2,742,500,000	1912	2,835,740,000
1903	2,401,268,000						

TABLE 87.—*Acreage, production, value, etc., of tobacco, United States, 1849–1913.*

NOTE.—Figures in *italics* are census returns; figures in roman are estimates of the Department of Agriculture. Estimates of acres are obtained by applying estimated percentages of increase or decrease to the published numbers of the preceding year, except that a revised base is used for applying percentage estimates whenever new census data are available.

Year.	Acreage (000 omitted).	Average yield per acre	Production (000 omitted)	Average farm price per pound Dec. 1
	Acres	*Lbs.*		*Cts.*
1849				
1859				
1869				
1879	*639*	*739.*		
1889	*695*	*702*		
1899	*1,101*	*788.*		
1900	1,046	778.		6.
1901	1,039	788.		7
1902	1,031	797.		7.
1903	1,038	786.		6.
1904	806	819.		8.
1905	776	815.		8.
1906	796	857.		10.
1907	821	850.		10.
1908	875	820.		10.
1909	1,180	804.		10.
1909	*1,295*	*816.*		
1910 [1]	1,366	807.		9.
1911	1,013	893.		9.
1912	1,226	785.		10.
1913	1,216	784.		12.

[1] Figures adjusted to census basis. [2] Preliminary.

TABLE 88.—*Acreage, production, and value of tobacco, by States, 1913.*

State	Acreage	Production	Farm value Dec. 1	State.	Acreage.	Production.	Farm value Dec. 1.
			Dollars		*Acres.*	*Pounds.*	*Dollars*
			30,000	Ohio	81,900	61,425,000	7,002,000
			28,000	Indiana	15,900	11,925,000	1,312,000
			1,986,000	Illinois	800	560,000	64,000
			5,989,000	Wisconsin	43,000	50,740,000	6,089,000
			535,000	Missouri	5,100	3,315,000	421,000
			3,501	Kentucky	370,000	281,200,000	28,120,000
			1,720	Tennessee	90,000	64,800,000	5,443,000
			21,40	Alabama	300	210,000	52,001
			1,224	Louisiana	600	270,000	68,000
			30,	Texas	200	120,000	26,000
			4,	Arkansas	800	520,000	85,000
			1,	United States	1,216,100	953,734,000	122,481,000

TOBACCO—Continued.

ABLE 89.—*Yield per acre, price per pound, and value per acre of tobacco, by States.*

Basis, Dec. 1 price.

TOBACCO—Continued.

TABLE 90.—*Acreage, yield per acre, production, and the Dec. 1 farm value of tobacc grown in the United States in 1913 and 1912, by types and districts.*

Type and district.	Acreage (thousands of acres).		Yield (pounds) per acre.		Production (thousands of pounds).		Price (cents) per pound Dec. 1.		Total farm value (thousands of dollars).[1]	
	1913	1912	1913	1912	1913	1912	1913	1912	1913	1912
I. CIGAR TYPES.										
New England	24.7	23.5	1,550	1,700	38,295	39,950	21.0	24.0	8,033	9,5
New York	4.3	4.0	1,020	1,300	4,386	5,200	12.2	12.6	535	65
Pennsylvania	38.9	44.2	1,200	1,420	46,680	64,090	7.5	8.5	3,501	5,44
Ohio—Miami Valley	51.3	54.0	730	990	37,449	53,460	11.0	8.0	4,119	4,27
Wisconsin	43.0	42.2	1,180	1,290	50,740	54,438	12.0	11.0	6,089	5,9
Georgia and Florida	5.8	4.5	1,000	837	5,800	3,766	31.0	30.0	1,798	1,13
II. CHEWING, SMOKING, SNUFF, AND EXPORT TYPES.										
Burley district	232.6	228.0	760	860	176,776	196,080	12.3	11.0	21,743	21,7
Dark districts of Kentucky and Tennessee:										
Paducah district	75.0	100.0	780	620	58,500	62,000	7.7	6.2	4,504	3,8
Henderson or stemming district	55.0	105.0	800	800	44,000	84,000	7.3	7.0	3,212	5,8
Upper Green River district	23.4	36.0	720	730	16,848	26,280	7.0	6.5	1,179	1,70
Upper Cumberland district	15.0	23.0	760	720	11,400	16,560	7.3	6.5	832	1,0
Clarksville and Hopkinsville district	115.0	120.0	700	660	80,500	79,200	9.0	7.8	7,245	6,1
Virginia sun-cured district	15.9	15.0	800	650	12,720	9,750	8.5	8.0	1,081	7
Virginia dark district	71.2	75.0	820	660	58,384	49,500	7.0	7.8	4,087	3,8
Bright yellow district:										
Old belt—Virginia and North Carolina	240.0	204.0	690	540	165,600	110,160	18.5	15.2	30,636	16,7
New belt—Eastern North Carolina and South Carolina	165.0	106.0	710	730	117,150	77,380	17.9	16.1	20,970	12,4
Maryland and eastern Ohio export	27.6	31.0	760	710	20,976	22,010	9.1	8.1	1,909	1,7
Perique Louisiana	.6	.5	450	300	270	150	25.0	30.0	68	
Scattering	10.0	9.9	......	......	7,260	8,881	......	......	940	1,0

[1] Basis, Dec. 1 price.

TOBACCO—Continued.

TABLE 91.—*Wholesale price of tobacco per pound, on given markets, 1899–1913.*

Date	Cincinnati, leaf, plug stock, common to good red [1]		Hopkinsville, leaf, common to fine.		Louisville, leaf (Burley, dark red), common to good		Clarksville, leaf, common to fine		Richmond, leaf, smokers, common to good.		Baltimore, leaf (Maryland), medium to fine red	
	Low.	High.	Low	High.	Low.	High	Low.	High.	Low.	High.	Low	High.
	Cents.	*Cents*	*Cents*	*Cents*	*Cents.*	*Cents.*	*Cents*	*Cents*	*Cents.*	*Cents*	*Cents*	*Cents.*
1899	5.00	20.00	4.00	14.00	6.00	20.00	5.50	13.00	......	......	5.00	10.00
1900	5.00	20.00	5.00	14.00	5.50	14.00	6.50	13.50	......	......	5.00	10.00
1901	4.50	12.00	5.00	15.00	5.50	12.50	6.00	14.00	......	......	6.00	11.00
1902	5.00	11.00	4.25	14.00	4.50	12.00	6.00	12.50	......	......	6.00	12.00
1903	4.00	12.00	5.00	13.50	5.00	13.75	5.50	13.00	......	......	6.50	12.00
1904	4.00	12.50	3.50	12.50	6.00	24.50	4.75	12.00	6.00	12.50	6.00	12.00
1905	4.00	14.00	5.00	14.00	5.50	14.50	5.75	13.00	8.00	13.00	6.00	12.00
1906	4.50	13.00	5.75	15.00	6.25	17.00	6.50	12.50	9.00	13.00	6.00	12.00
1907	6.50	17.50	6.50	16.00	6.50	14.50	7.50	17.00	9.00	13.00	6.50	12.00
1908	8.00	20.00	7.50	20.00	9.00	19.00	9.00	18.00	5.00	13.25	6.50	13.00
1909	12.00	20.00	6.00	14.00	12.00	18.50	7.50	14.00	5.00	10.00	8.50	13.00
1910	7.00	16.75	6.00	17.50	8.00	17.00	8.00	16.50	5.00	10.00	8.50	13.00
1911	5.50	14.50	7.00	18.00	6.00	12.75	9.50	15.50	5.00	12.00	8.50	13.00
1912	5.00	11.00	8.00	16.00	7.00	13.00	9.50	15.00	6.00	12.00	8.50	15.00
1913.												
Jan.	5.50	13.75	9.00 [2]	14.00	7.00	12.00	9.50	13.00	6.00 [3]	12.00	8.50	15.00
Feb.	5.50	13.75	8.50	14.00	7.00	12.00	9.50	13.00	6.00	12.00	8.50	15.00
Mar.	5.50	13.75	8.00	12.50	7.00	12.00	9.50	13.00	6.00	12.00	8.50	15.00
Apr.	5.50	13.75	7.00	12.50	7.00	12.00	9.00	14.00	7.00	16.00	8.50	15.00
May	5.50	13.75	7.75	12.50	7.00	13.00	9.00	14.00	7.00	16.00	8.50	15.00
June	5.50	13.75	8.00	13.50	8.00	14.00	9.00	14.00	7.00	16.00	8.50	15.00
July	5.50	13.75	9.00	13.50	9.00	14.00	8.50	14.00	7.00	16.00	8.50	15.00
Aug.	5.50	13.75	8.75	14.00	9.00	15.00	8.50	14.50	7.00	16.00	8.50	15.00
Sept.	5.50	13.75	9.00	14.00	10.00	15.00	9.50	15.00	7.00	16.00	8.50	15.00
Oct.	5.50	13.75	9.00	14.00	11.00	15.00	9.50	15.00	7.00	16.00	8.50	15.00
Nov.	5.50	13.75	9.00	14.00	11.00	15.00	9.50	15.00	7.00	16.00	8.50	15.00
Dec.	5.50	13.75	9.00	14.00	10.50	16.00	9.50	15.00	......	......	8.50	15.00
Year.	5.50	13.75	7.00	14.00	7.00	16.00	8.50	15.00	6.00	16.00	8.50	15.00

[1] Common to fine red 1899-1901
[2] Common to good, March to December, inclusive.
[3] Brights, smokers, common to fine, April to November, inclusive

TABLE 92.—*International trade in unmanufactured tobacco, calendar years 1910–1912.*

[Tobacco comprises leaf, stems, strippings, and *tombac*, but not snuff. See "General note," p. 375.]

EXPORTS.

[000 omitted.]

Country.	1910	1911	1912	Country.	1910	1911	1912

[1] Year beginning Apr. 1.
[2] Data for 1909.
[3] Year preceding.
[4] Year beginning Mar. 21.
[5] Year beginning Mar. 14.
[6] Data for 1910.
[7] Preliminary.

TOBACCO—Continued.

Table 92.—*International trade in unmanufactured tobacco, calendar years 1910-1912*—Continued.

IMPORTS.

Country.	1910
	Pouna
Aden[1]	8,98
Argentina	12,43
Australia	13,58
Austria-Hungary	53,31
Belgium	20,99
British India	8,58
Canada	16,67
China	13,66
Denmark	9,27
Egypt	18,10
Finland	9,38
France	61,20
Germany	146,92

[1] Year beginning Apr. 1. [2] Year preceding. [3] Preliminary.

FLAX.

Table 93.—*Flax crop of countries named, 1910–1912.*

[000 omitted.]

Country.	Area.			Production.					
				Seed.			Fiber.		
	1910	1911	1912	1910	1911	1912	1910	1911	1912
NORTH AMERICA.	*Acres.*	*Acres.*	*Acres.*	*Bush.*	*Bushels.*	*Bushels.*	*Pounds.*	*Pounds.*	*Pounds.*
United States	2,467	2,757	2,851	12,718	19,370	28,073			
Canada:									
Quebec	1	1	1	13	13	9			
Ontario	9	9	9	83	124	143			
Manitoba	35	80	100	177	1,152	1,252			
Saskatchewan	506	682	1,780	3,893	7,672	23,033			
Alberta	31	107	132	78	1,114	1,693			
Total Canada	582	879	2,022	4,244	10,075	26,130			
Mexico	(1)	(1)	(1)	150	150	150			
Total				17,112	29,595	54,353			
SOUTH AMERICA.									
Argentina	3,596	3,716	4,028	28,212	23,424	22,518			
Uruguay	(1)	95	143	600	660	1,057			
Total				28,812	24,084	23,575			
EUROPE.									
Austria-Hungary:									
Austria	96	95	91	663	607	650	50,191	46,646	51,532
Hungary proper	21	21	(1)	164	174	174	18,492	13,982	(1)
Croatia-Slavonia	18	17	(1)	21	15	15	8,143	6,448	(1)
Bosnia-Herzegovina	(1)	(1)	(1)	4	4	4	1,000	1,006	1,000
Total Austria-Hungary				852	800	843	77,826	68,082	

[1] No official data.

FLAX—Continued.

Table 93.—*Flax crop of countries named, 1910-1912*—Continued.

[000 omitted.]

Country.	Area.			Production.					
				Seed.			Fiber.		
	1910	1911	1912	1910	1911	1912	1910	1911	1912
rope—continued.	*Acres.*	*Acres.*	*Acres.*	*Bush.*	*Bush.*	*Bush.*	*Pounds.*	*Pounds.*	*Pounds.*
gium	(1)	49	54	500	515	514	50,000	52,000	64,000
garia	1	1	(1)	8	10	10	709	800	800
nce	54	59	69	416	496	570	33,106	45,004	46,074
y	22	22	22	232	341	343	6,883	6,078	5,511
herlands	29	39	36	316	579	428	14,189	20,929	21,217
umania	33	52	79	363	603	772	4,448	4,000	5,000
sia:									
ussia proper	3,048	3,237	3,237	16,743	18,877	20,574			(1)
and	88	96	80	816	935	793			(1)
orthern Caucasia	80	96	137	590	732	810			(1)
Total Russia (European)	3,216	3,428	3,454	18,149	20,544	22,177	[2] 702,477	[2] 785,136	[2] 1,172,069
in	4	4	(1)				2,192	2,091	(1)
den	(1)	4	5	20	17	17	1,400	1,500	(1)
and	46	67	55				19,882	25,179	29,125
Total				20,856	23,995	25,680	913,112	1,010,743	
ASIA.									
ish India	3,188	3,757	5,052	17,112	22,544	25,680			
sia:									
ntral Asia	90	125	89	429	220	358	(1)	(1)	(1)
beria	137	154	137	832	786	779	(1)	(1)	(1)
ranscaucasia	20	19		96	94		(1)	(1)	(1)
Total Russia (Asiatic)	247	298	226	1,357	1,090	1,137			
Total				18,469	23,643	26,817			
AFRICA									
ria	1	2	1	4	16	13	(1)	(1)	(1)
Grand total				85,253	101,333	130,438	913,112	1,010,743	

[1] No official data. [2] Includes 27 governments only.

ble 94.—*Total production of flax (seed and fiber) in countries named in Table 93, 1896-1912.*

FLAX—Continued.

TABLE 95.—*Acreage, production, value, etc., of flaxseed, United States, 1849-1913.*

NOTE.—Figures in *italics* are census returns; figures in roman are estimates of the Department of Agri culture. Estimates of acres are obtained by applying estimated percentages of increase or decrease t the published numbers of the preceding year, except that a revised base is used for applying percentag estimates whenever new census data are available.

Year.	Acreage.	Average yield per acre.	Production.	Average farm price Dec. 1.	Farm value Dec. 1.	Condition of growing crop. July 1.	Condition of growing crop. Aug. 1.	Condition of growing crop. Sept. 1.	Condition of growing crop. When harvested.
	Acres.	*Bushels.*	*Bushels.*	*Cents.*	*Dollars.*	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*
1849			*562,000*						
1859			*567,000*						
1869			*1,730,000*						
1879			*7,170,000*						
1889	*1,319,000*	*7.8*	*10,250,000*						
1899	*2,111,000*	*9.5*	*19,979,000*						
1902	3,740,000	7.8	29,285,000	105.0	30,815,000				
1903	3,233,000	8.4	27,301,000	81.7	22,292,000	86.2	80.3	80.5	74.
1904	2,264,000	10.3	23,401,000	99.3	23,229,000	86.6	78.9	85.8	87.
1905	2,535,000	11.2	28,478,000	84.4	24,049,000	92.7	96.7	94.2	91.
1906	2,506,000	10.2	25,576,000	101.3	25,899,000	93.2	92.2	89.0	87.
1907	2,864,000	9.0	25,851,000	95.6	24,713,000	91.2	91.9	85.4	78.
1908	2,679,000	9.6	25,805,000	118.4	30,577,000	92.5	86.1	82.5	81.
1909	2,742,000	9.4	25,856,000	152.6	39,466,000	95.1	92.7	88.9	84.
1909	*2,083,000*	*9.4*	*19,513,000*						
1910 [1]	2,467,000	5.2	12,718,000	231.7	29,472,000	65.0	51.7	48.3	47.
1911	2,757,000	7.0	19,370,000	182.1	35,272,000	80.9	71.0	68.4	69.
1912	2,851,000	9.8	28,073,000	114.7	32,202,000	88.9	87.5	86.3	83.
1913	2,291,000	7.8	17,853,000	119.9	21,399,000	82.0	77.4	74.9	74.

[1] Figures adjusted to census basis.

TABLE 96.—*Acreage, production, and value of flaxseed, by States, 1913.*

State.	Acreage.	Average yield per acre.	Production.	Average farm price Dec. 1.	Farm value Dec. 1.	Value per acre Dec. 1.
	Acres.	*Bushels.*	*Bushels.*	*Dollars.*	*Dollars.*	*Dollars.*
Wisconsin	9,000	14.0	126,000	1.23	155,000	17.2
Minnesota	350,000	9.0	3,150,000	1.23	3,874,000	11.0
Iowa	28,000	9.4	263,000	1.23	323,000	11.5
Missouri	10,000	5.0	50,000	1.15	58,000	5.7
North Dakota	1,000,000	7.2	7,200,000	1.21	8,712,000	8.7
South Dakota	425,000	7.2	3,060,000	1.20	3,672,000	8.6
Nebraska	9,000	6.0	54,000	1.10	59,000	6.6
Kansas	50,000	6.0	300,000	1.16	348,000	6.9
Montana	400,000	9.0	3,600,000	1.15	4,140,000	10.3
Colorado	10,000	5.0	50,000	1.15	58,000	5.7
United States	2,291,000	7.8	17,853,000	1.20	21,399,000	9.3

FLAX—Continued.

BLE 97.—*Farm price of flaxseed per bushel, on first of each month, by geographical divisions, 1912 and 1913.*

Month.	United States.		North Central States east of Mississippi River.		North Central States west of Mississippi River.		Far Western States.	
	1913	1912	1913	1912	1913	1912	1913	1912
	Cents.	*Cents.*	*Cents.*	*Cents.*	*Cents.*	*Cents.*	*Cents.*	*Cents.*
ary	106.2	187.1	137.0	190.0	107.0	184.0	100.0	....
ruary	109.3	190.8	119.0	188.0	112.0	191.0	98.0	190.0
ch	119.0	183.9	130.0	195.0	120.0	186.0	115.0	171.0
l	113.6	191.3	130.0	200.0	110.0	189.0	129.0	200.0
	114.3	181.0	138.0	212.0	114.0	199.0	113.0	215.0
	115.8	205.0	110.0	215.0	116.0	205.0	116.0	....
	113.4	198.4	105.0	188.0	114.0	198.0	110.0	....
ust	118.6	175.2	....	188.0	118.0	175.0	121.0	175.0
ember	127.8	162.6	135.0	192.0	127.0	163.0	130.0	160.0
ber	122.6	147.7	160.0	178.0	124.0	148.0	114.0	....
ember	118.7	133.4	118.0	....	120.0	133.0	114.0	....
ember	119.9	114.7	123.0	127.0	121.0	115.0	115.0	112.0

TABLE 98.—*Wholesale price of flaxseed per bushel, 1899–1913.*

Date.	St. Louis.		Cincinnati.		Chicago.		Milwaukee.		Duluth.	
	Prime.				No. 1 and No. 1 Northwestern.		No. 1 Northwestern.			
	Low.	High.	Low.	High.	Low.	High.	Low.	High.	Low.	High.
	$0.93	$1.46	$0.90	$1.00	$0.96½	$1.51	$0.99	$1.52	$0.90	$1.42
	1.25	1.78	1.00	1.45	1.32	1.86	1.30	1.86	1.28½	1.87
	1.37	1.72	1.20	1.50	1.38	1.90	1.30	1.88	1.33	1.88
	1.11	1.65	1.25	1.40	1.13	1.80	1.18	1.80	1.15¼	1.78
	.86	1.17	1.00	1.30	.89	1.24	.94	1.24	.92	1.20
	.92½	1.18½	1.00	1.00	.97	1.28	1.06	1.28	1.01½	1.28
	.90	1.30	1.10	1.10	.92	1.47	.98	1.47	.96¼	1.50
	.98	1.19	1.10	1.12	1.03	1.25	1.05	1.25	1.09¼	1.25
	1.00	1.27	1.12	....	.96	1.36½	1.07	1.34	1.06¼	1.41½
	1.00	1.39½	1.12	1.25	1.06½	1.51½	1.12	1.47	1.12¾	1.49⅝
	1.15	1.90	1.25	....	1.29	1.99	1.35	2.09	1.36½	2.04½
	1.80	2.68	1.75	2.75	1.75	2.84	1.91½	2.75	1.89	2.84
	1.80	2.60½	2.50	2.75	1.93	2.74½	1.92	2.70	1.93	2.70
	1.18	2.21	1.50	2.80	1.28	2.20	1.24½	2.39	1.22	2.53
1913.										
ary	1.21	1.33	1.50	1.50	....	....	1.25¾	1.37⅛	1.22⅝	1.32½
ruary	1.30	1.38	1.50	1.50	....	....	1.31⅛	1.42¾	1.28	1.39
ch	1.28	1.31	1.50	1.50	....	....	1.26½	1.32¼	1.23¼	1.29
l	1.28½	1.41	1.50	1.50	....	....	1.25½	1.34½	1.23	1.35¼
	1.30	1.38	1.50	1.50	....	....	1.27	1.33½	1.27⅜	1.32¾
	1.10	1.30	1.50	1.50	....	....	1.27⅞	1.34	1.29⅝	1.35⅝
	1.24	1.24	1.50	1.50	....	....	1.32¾	1.41¼	1.35	1.41¾
ust	1.27	1.32	1.50	1.50	....	....	1.40	1.54½	1.41⅝	1.53⅛
ember	1.24	1.35	1.50	1.50	....	....	1.38½	1.51½	1.39¾	1.51
ber	....	....	1.50	1.50	....	....	1.33⅛	1.42⅜	1.35¼	1.42¾
ember	....	....	1.50	1.50	....	....	1.30¾	1.41¼	1.34⅝	1.41
ember	....	....	1.50	1.50	....	....	1.36½	1.50	1.39¼	1.48⅝
Year	1.10	1.41	1.50	1.50	....	....	1.25½	1.51½	1.22⅝	1.53⅛

RICE.

TABLE 99.—*Rice crop of countries named, 1908–1912.*

[Mostly cleaned rice. The United States crop as given here is computed from the official returns, whi are for rough rice, allowing 45 pounds rough to 1 bushel, and 162 pounds rough to 100 pounds cleaned.]

[000 omitted.]

[1] Census, 1899.
[2] Census, 1909.
[3] Data for 1904.
[4] Data for 1913.
[5] Date for 1901.
[6] Data for 1906.
[7] Data for 1910.
[8] Estimated from official returns of acreage.
[9] Data for 1908.
[10] Official report for crop of 1904–5.
[11] Year preceding.
[12] Average production as unofficially estimated.
[13] Data for European and Asiatic Turkey include 29 provinces and arrondissements only.
[14] Data for 1909.
[15] Data for British India refer to crop years begi ning in the spring of the calendar years mentione in this table. Production as given here estimate unofficially for the entire country on the basis official returns for about 70 per cent of the area ha vested.
[16] Estimated from official returns of exports this country and from per capita consumption of ri in Japan 1894–1903, including food, seed, and wast but not including rice used for saké (270 pounds p annum).

RICE—Continued.

TABLE 99.—*Rice crop of countries named, 1908-1912*—Continued.

Country.	1908	1909	1910	1911	1912
AFRICA.	*Pounds.*	*Pounds.*	*Pounds.*	*Pounds.*	*Pounds.*
Egypt [1]	577,379	630,894	666,459	527,120	524,569
Madagascar	953,000	[2] 953,000	[2] 953,000	[2] 953,000	[2] 953,000
Nyassaland [3]	1,600	1,900	1,984	1,947	1,337
Total	1,531,979	1,585,794	1,621,443	1,482,067	1,478,906
OCEANIA.					
Fiji [1]	3,000	4,937	6,894	7,922	[4] 7,922
Grand total	153,867,072	178,864,408	177,418,621	175,337,498	162,438,2.8

[1] Estimated from official returns of acreage.
[2] Data for 1908.
[3] Includes only crops raised by natives.
[4] Year preceding.

TABLE 100.—*Total production of rice in countries named in Table 99, 1900–1912.*[1]

Year	Production.	Year.	Production.
			Pounds.
1900	9 000	1907	152,558,132,000
1901	9 000	1908	153,866,842,000
1902	10 000	1909	178,864,408,000
1903	11 000	1910	177,418,621,000
1904	11 000	1911	175,337,498,000
1905	10 000	1912	162,438,298,000
1906	11 000		

[1] China not included prior to 1907.

TABLE 101.—*Acreage, production, value, etc., of rice, United States, 1904–1913.*

Year.	Acreage	Average yield per acre	on	Average m ce 1.	Farm value Dec. 1.	Condition of growing crop. July 1	Aug. 1.	Sept. 1.	When harvested.
				ts.	*Dollars.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*
				5.8	13,892,000	88.2	90.2	89.7	87.3
				6.0	12,286,000	88.0	92.9	92.2	80.3
				0.3	16,121,000	82.9	83.1	86.8	87.2
				5.8	16,081,000	85.7	88.6	87.0	88.7
				1.2	17,771,000	92.9	94.1	93.6	87.7
				9.4	19,341,000	90.7	84.5	84.7	81.2
				7.8	16,624,000	86.3	87.6	88.8	88.1
				9.7	18,274,000	87.7	88.3	87.2	85.4
				3.5	23,423,000	86.3	86.3	88.8	89.2
				5.8	22,090,000	88.4	88.7	88.0	80.3

RICE—Continued.

TABLE 102.—*Acreage, production, value, etc., of rice, by States*

State.	Acreage.	Average yield per acre.	Production.	Average farm price Dec. 1.	Farm v[alue] Dec. [1]
	Acres.	*Bushels.*	*Bushels.*	*Cents.*	*Dolla[rs]*
North Carolina	300	24	7,000	80	[illegible]
South Carolina	4,900	30	147,000	90	13
Georgia	500	32	16,000	83	1
Florida	400	25	10,000	60	[illegible]
Alabama	200	22	4,000	60	[illegible]
Mississippi	1,500	28	42,000	70	2
Louisiana	405,500	29	11,760,000	84	9,87
Texas	303,000	32	9,696,000	86	8,33
Arkansas	104,700	36	3,769,000	90	3,39
California	6,100	48	293,000	100	29
United States	827,100	31.1	25,744,000	85.8	22,09

TABLE 103.—*Wholesale price of rice per pound, 1899–191*

Date.	New York.		Cincinnati.		Lake Charles.		New Orleans.	
	Domestic (good).		Prime.[1]		Rough.[2]		Honduras, cleaned.	
	Low.	High.	Low.	High.	Low.	High.	Low.	High.
	Cents.	*Cents.*	*Cents.*	*Cents.*	*Dolls.*	*Dolls.*	*Cents.*	*Cents.*
1899	4¾	5½	5¼	6¾	......	......	3¾	6⅝
1900	4¾	5	5½	6	......	......	3¾	6⅝
1901	4¾	5	5½	6½	1.70	3.50	1⅝	6⅝
1902	4¾	5¼	5¼	6½	1.75	3.40	1½	6½
1903	4¼	5¼	4⅝	5½	1.50	3.60	1⅜	6½
1904	3⅜	4¼	3¾	5¼	1.00	3.00	1 1/16	5¼
1905	3⅝	4½	3	5¼	1.00	3.85	1	5¾
1906	4⅞	5½	4½	5½	2.00	3.85	1⅛	6
1907	5	6	4¾	6	1.75	4.10	1½	6½
1908	5	6½	6¼	7½	1.75	4.33	1¾	7⅜
1909	4¾	5⅞	6	7	1.50	3.75	1⅛	6½
1910	4	5⅛	6	6½	1.55	3.25	1⅛	6⅛
1911	3⅝	4⅜	6	6½	1.75	3.50	1⅛	5⅜
1912	4¼	5¼	6	7	2.00	3.70	2	6
1913.								
January	4¾	5	5¼	6¼	2.50	3.82	2⅞	5⅝
February	4¾	5	5¼	6	2.50	3.70	2¾	[illegible]
March	4¾	5	5¼	6	......	......	2¾	5⅝
April	4¾	5	5¼	6	......	......	2⅝	5⅝
May	4¾	5	5¼	6	......	......	2⅝	5⅝
June	4¾	5	5¼	6¼	......	......	2⅝	5½
July	4¾	5¼	5¾	6¼	......	......	2⅝	6¼
August	5	5¼	5¾	6¼	......	......	1¾	7
September	5	5¼	5¾	6¼	2.00	3.30	1¾	5⅞
October	5	5¼	5¾	6¼	2.25	3.71	1 11/16	6
November	5	5¼	5¾	6¼	2.00	3.76	1.15	6
December	4¾	5¼	5¾	6¼	2.00	3.63	1⅝	6
Year	4¾	5¼	5¼	6¼	2.00	3.82	1.15	7

[1] Louisiana grade, 1899 to 1901; fancy head, 1909 to 1912, inclusive.
[2] Per barrel of 162 pounds.

RICE—Continued.

Table 104.—*International trade in rice, calendar years 1910–1912.*

[Mostly cleaned rice.]

[Under rice is included paddy, unhulled, rough, cleaned, polished, broken, and cargo rice, in addition to rice flour and meal. Rice bran is not included. Rough rice or paddy, where specifically reported, has been reduced to terms of cleaned rice at ratio of 162 pounds rough, or unhulled, to 100 pounds cleaned. "Rice, other than whole or cleaned rice," in the returns of United Kingdom is not considered paddy, since the chief sources of supply indicate that it is practically all hulled rice. Cargo rice, a mixture of hulled and unhulled, is included without being reduced to terms of cleaned. Broken rice and rice flour and meal are taken without being reduced to terms of whole cleaned rice. See "General note," p. 375.]

EXPORTS.

[000 omitted.]

Country.	1910	1911	1912
	Pounds.	*Pounds.*	*Pounds*
Penang	334,458	337,520	[1] 337,520
Siam	2,336,513	1,365,349	1,296,965
Singapore	808,021	722,123	[1] 722,123
Other countries	851,372	858,765	[2] 852,747
Total	13,157,325	12,117,164	12,425,816

IMPORTS.

[1] Year preceding. [2] Preliminary. [3] Data for 1909.

HOPS.

Table 105.—*Hop crop of countries named, 1911–1913.*

[000 omitted.]

Country.	1911	1912	1913 (preliminary).	Country.	1911	1912	1913 (preliminary)
NORTH AMERICA.	*Pounds*	*Pounds.*	*Pounds.*	EUROPE—contd.	*Pounds.*	*Pounds*	*Pounds.*
United States [1]	51,672	53,371	[2] 56,425	Netherlands [4]	158	158	158
Canada [3]	1,208	1,208	1,208	Russia	13,903	14,084	16,973
Total	52,880	54,579	57,633	U. K.—England	36,739	41,825	25,632
EUROPE.				Total	108,341	165,585	107,582
Austria-Hungary:				AUSTRALASIA.			
Austria	18,989	44,414	19,103	Australia:			
Hungary	2,544	4,012	[2] 4,917	Victoria	105	87	[5] 87
				Tasmania	1,775	1,058	[5] 1,058
Total Austria-Hungary	21,533	48,426	24,020	New Zealand [6]	709	710	[6] 710
				Total	2,589	1,855	1,855
Belgium	6,779	7,000	6,524	Grand total	163,810	222,019	167,070
France	5,799	8,758	7,867				
Germany	23,430	45,334	28,408				

[1] Commercial movement for years beginning July 1, based upon exports, imports, and internal-revenue data for hops used in brewing.
[2] Unofficial estimate.
[3] Census for 1910.
[4] Estimated average 1900–1909.
[5] Year preceding.
[6] Estimate based on the official figures for area, multiplied by yield as given in census of 1906, 1,058 pounds.

HOPS—Continued.

TABLE 106.—*Total production of hops in countries named in Table 105, 1895–1913.*

[1] Preliminary.

TABLE 107.—*Wholesale price of hops per pound, 1900–1913.*

[1] Choice 1900–1907. [2] Common to choice 1900–1908. [3] Prime to choice.

HOPS—Continued.

TABLE 108.—*International trade in hops, calendar years 1910–1912.*

[Lupulin and *hopfenmehl* (hop meal) are not included with hops in the data shown. See "General note," p. 375.]

EXPORTS.

[000 omitted.]

Country.	1910	1911	1912	Country.	1910	1911	1912
	Lbs.	*Lbs.*	*Lbs.*		*Lbs.*	*Lbs.*	*Lbs.*
Austria-Hungary	18,575	11,706	28,182	Russia	726	2,224	2,276
Belgium	2,727	8,958	3,969	United Kingdom	1,000	5,479	1,318
France	181	899	590	United States	12,749	14,104	15,572
Germany	19,116	16,744	18,254	Other countries	230	59	[2] 240
Netherlands	1,189	1,154	535				
New Zealand	431	205	[1] 205	Total	56,924	61,092	71,140

IMPORTS.

Country.	1910	1911	1912	Country.	1910	1911	1912
Australia	1,135	907	1,129	Netherlands	2,658	2,911	2,090
Austria-Hungary	289	2,180	487	Russia	1,405	1,045	1,580
Belgium	5,583	8,823	6,562	Sweden	897	842	[1] 842
British India	234	285	247	Switzerland	1,284	1,256	1,746
British South Africa	532	541	498	United Kingdom	19,268	16,922	26,356
Canada	1,072	1,271	1,667	United States	5,824	5,587	5,663
Denmark	1,042	1,007	1,235	Other countries	2,966	4,570	[2] 4,378
France	5,146	7,424	4,229				
Germany	6,991	6,100	11,790	Total	56,326	61,651	70,508

[1] Year preceding. [2] Preliminary.

BEANS.

TABLE 109.—*Bean crop of countries named, 1910–1912.*

[1] Census figures for 1909.
[2] No data.
[3] Includes other pulse.
[4] Grown alone.
[5] Grown with corn.
[6] Census figures for 1907.

BEANS—Continued.

TABLE 109.—*Bean crop of countries named, 1910–1912*—Continued.

Country.	Area.			Production.		
	1910	1911	1912	1910	1911	1912
EUROPE—continued.	*Acres.*	*Acres.*	*Acres.*	*Bushels.*	*Bushels.*	*Bushels.*
France	550,000	578,000	558,000	9,639,000	8,187,000	9,739,000
Italy	1,504,000	1,510,000	1,476,000	18,730,000	18,990,000	14,778,000
Luxemburg	4,000	3,000	3,000	90,000	51,000	52,000
Netherlands	66,000	63,000	59,000	1,804,000	1,664,000	1,939,000
Roumania [1]	70,000	92,000	103,000	732,000	1,058,000	1,109,000
Do.[2]	1,127,000	1,252,000	1,316,000	2,993,000	3,544,000	3,528,000
Russia:						
Russia proper	150,000			1,896,000		
Poland	36,000			404,000		
Northern Caucasia	3,000			49,000		
Total Russian (European)	189,000	157,000	166,000	2,349,000	2,599,000	2,765,000
Servia	24,000	(3)	(3)	2,279,000	1,453,000	2,000,000
Spain	1,095,000	1,114,000	1,120,000	12,037,000	13,035,000	10,534,000
Sweden	10,000	10,000	(3)	173,000	171,000	173,000
United Kingdom:						
England	256,000	294,000	270,000	8,519,000	7,572,000	7,634,000
Wales	1,000	1,000	1,000	40,000	29,000	29,000
Scotland	10,000	9,000	9,000	383,000	323,000	306,000
Ireland	2,000	2,000	1,000	77,000	60,000	61,000
Total United Kingdom	269,000	306,000	281,000	9,019,000	7,984,000	8,030,000
Total				80,009,000		
ASIA.						
British India [4]	13,153,000	13,946,000	(3)	(3)	(3)	(3)
Japan	1,518,000	1,544,000	(3)	22,331,000	23,798,000	(3)
Formosa [4]	66,000	83,000	(3)	665,000	604,000	(3)
Russia (22 governments)	28,000	26,000	27,000	259,000	294,090	375,000
AFRICA.						
Algeria	94,000	99,000	(3)	1,109,000	1,132,000	(3)
Egypt	582,000	563,000	539,000	(3)	(3)	(3)
AUSTRALASIA.						
Australia: [5]						
New South Wales				13,000	7,000	20,000
Victoria	10,000	11,000	12,000	150,000	233,000	189,000
South Australia	8,000	10,000	12,000	134,000	202,000	162,000
Western Australia	1,000	1,000	1,000	9,000	5,000	5,000
Tasmania	16,000	20,000	24,000	384,000	514,000	460,000
Total Australia	35,000	42,000	49,000	690,000	961,000	836,000
New Zealand	(3)	2,000	(3)	(3)	74,000	(3)
Total Australasia		44,000			1,035,000	

[1] Grown alone.
[2] Grown with corn.
[3] No data.
[4] Includes other pulse.
[5] Includes peas.

BEANS—Continued.

TABLE 110.—*Wholesale price of beans per bushel, 1899–1913.*

Date.	Boston.		Chicago.		Detroit.		San Francisco.	
	Pea.		Pea.		Pea.		Small white (per 100 lbs.).	
	Low.	High.	Low.	High.	Low.	High.	Low.	High.
1899	......	......	$0.90	$1.87	$1.01	$1.80	$2.00	$3.00
1900	......	......	1.65	2.25	1.55	2.10	2.85	4.50
1901	$2.00	$2.75	.90	2.80	1.66	2.40	2.00	5.00
1902	1.60	2.55	.85	2.49	1.28	1.98	3.30	4.65
1903	2.10	2.45	.90	2.40	1.82	2.35	2.40	3.40
1904	1.72½	2.20	.90	2.05	1.58	1.98	2.75	3.32½
1905	1.75	2.00	1.00	1.85	1.49	1.85	2.75	3.60
1906	1.50	1.80	1.10	1.65	1.27	1.61	......	......
1907	1.42	2.45	[1] 1.10	[1] 2.65	1.28	2.25	2.60	3.60
1908	2.30	2.75	1.65	2.70	2.00	2.65	3.40	4.75
1909	2.25	2.75	1.75	2.67	2.00	2.55	4.00	7.50
1910	2.25	2.70	1.85	2.78	1.92	2.40	3.25	4.85
1911	2.05	2.65	1.76	2.57	1.87	2.40	3.00	4.20
1912	2.55	3.10	1.90	3.20	2.15	2.70	4.00	4.80
1913.								
January	2.50	2.60	1.50	2.50	2.10	2.20	4.55	4.65
February	2.50	2.50	1.50	2.30	2.00	2.10	4.55	4.70
March	2.40	2.45	1.50	2.27	1.80	2.05	4.50	4.70
April	2.35	2.40	1.25	2.35	1.90	2.10	4.50	5.50
May	2.40	2.50	1.25	2.35	2.05	2.10	4.85	5.60
June	2.40	2.50	1.25	2.30	2.05	2.05	5.50	5.85
July	2.35	2.40	1.25	2.25	1.95	2.05	5.60	5.85
August	2.20	2.25	1.15	1.95	1.75	1.85	5.40	5.70
September	2.20	2.40	1.25	2.10	1.80	1.95	5.20	5.50
October	2.25	2.40	1.50	2.20	1.80	1.95	5.20	5.40
November	2.20	2.30	1.50	2.25	1.80	1.95	4.50	5.40
December	2.15	2.25	1.60	2.15	1.75	1.90	4.50	5.40
Year	2.15	2.60	1.15	2.50	1.75	2.20	4.50	5.85

[1] Common to fine.

PEAS.

TABLE 111.—*Pea crop of countries named, 1910–1912.*

Country.	Area.			Production.		
	1910	1911	1912	1910	1911	1912
NORTH AMERICA.	*Acres.*	*Acres.*	*Acres.*	*Bushels.*	*Bushels.*	*Bushels.*
United States	1,302,000	(1)	(1)	[2] 7,110,000	(1)	(1)
Canada:						
Prince Edward Island	(1)	(1)	(1)	1,000	2,000	2,000
Nova Scotia	(1)	(1)	(1)	2,000	5,000	5,000
New Brunswick	(1)	1,000	1,000	6,000	17,000	10,000
Quebec	30,000	32,000	30,000	432,000	517,000	449,000
Ontario	322,000	258,000	226,000	4,311,000	4,065,000	3,374,000
Manitoba	(1)	(1)	(1)	5,000	9,000	10,000
Saskatchewan	(1)	(1)	(1)	3,000	8,000	11,000
Alberta	(1)	(1)	(1)	4,000	8,000	9,000
British Columbia	2,000	1,000	1,000	44,000	45,000	43,000
Total Canada	354,000	292,000	258,000	4,808,000	4,666,000	3,913,000
Total				11,918,000		
SOUTH AMERICA.						
Argentina	(1)	(1)	(1)	(1)	(1)	(1)
Chile [3]	29,000	26,000	28,000	463,000	525,000	7[illegible]8,000
EUROPE.						
Austria	(4)	(4)	(4)	(4)	(4)	(4)
Hungary [5]	33,000	33,000	(1)	438,000	418,000	(1)
Croatia-Slavonia [5]	13,000	12,000	(1)	165,000	171,000	(1)
Belgium [6]	[2] 12,000	12,000	12,000	[2] 445,000	417,000	409,000
France [5]	72,000	73,000	73,000	1,380,000	1,134,000	1,277,000
Luxemburg	2,000	2,000	2,000	34,000	31,000	24,000
Netherlands	65,000	55,000	64,000	1,260,000	1,838,000	1,868,000
Roumania [5]	29,000	34,000	46,000	565,000	598,000	678,000
Russia:						
Russia proper	3,175,000			33,651,000		
Poland	397,000			4,691,000		
Northern Caucasia	11,000			123,000		
Total Russia (European)	3,583,000	3,484,000	3,472,000	38,465,000	32,962,000	41,916,000
Servia	4,000	3,000	(1)	35,000	71,000	70,000
Spain [3]	1,139,000	1,219,000	1,204,000	11,610,000	11,444,000	9,885,000
Sweden	43,000	44,000	(1)	1,295,000	1,277,000	1,050,000
United Kingdom:						
England	151,000	139,000	172,000	4,098,000	3,788,000	4,007,000
Wales	1,000	1,000	1,000	16,000	14,000	15,000
Scotland	1,000	1,000	1,000	17,000	13,000	18,000
Ireland				7,000	9,000	8,000
Total United Kingdom	153,000	141,000	174,000	4,138,000	3,824,000	4,048,000
ASIA.						
Russia (22 governments) [5]	107,000	133,000	127,000	1,024,000	993,000	1,045,000
AFRICA.						
Algeria	23,000	23,000		312,000	294,000	313,000
AUSTRALASIA.						
New Zealand	(1)	15,000	20,000	(1)	528,000	666,[illegible]

[1] No data.
[2] Census figures for 1909.
[3] Includes chick-peas, lentils, vetches.
[4] Included under beans.
[5] Includes lentils.
[6] Includes vetches.

SUGAR.

TABLE 112.—*Production of sugar in countries named, 1910–11 to 1912–13.*

[All data are from official sources, except where otherwise stated. Some figures in the table refer to raw and some to refined sugar, according to the kind reported in the original returns.]

Country.	1910–11	1911–12	1912–13 (preliminary).
CANE SUGAR.			
NORTH AMERICA.			
United States:			
Contiguous—	*Long tons.*	*Long tons.*	*Long tons.*
Louisiana	305,000	315,000	137,000
Texas	11,000	7,000	8,000
Noncontiguous—			
Hawaii	513,000	531,000	488,000
Porto Rico	312,000	331,000	350,000
Total U. S.	1,141,000	1,184,000	983,000
Central America			
British Honduras	1,000	....	....
Costa Rica [1]	2,000	2,000	2,000
Guatemala [1]	15,000	15,000	16,000
Nicaragua [1]	4,000	4,000	4,000
Salvador [1]	17,000	17,000	17,000
Mexico	159,000	153,000	[2] 153,000
West Indies:			
British—			
Antigua	14,000	12,000	[2] 12,000
Barbados	40,000	27,000	29,000
Jamaica	28,000	28,000	28,000
St. Christopher-Nevis	13,000	11,000	11,000
St. Lucia	5,000	4,000	[2] 4,000
Trinidad and Tobago	52,000	41,000	41,000
Cuba	1,460,000	1,896,000	2,429,000
Danish [3]	12,000	10,000	6,000
French—			
Guadeloupe [3]	42,000	35,000	32,000
Martinique [3]	39,000	39,000	40,000
Santo Domingo [3]	91,000	84,000	87,000
Total	3,138,000	3,502,000	3,893,000
SOUTH AMERICA.			
Argentina [4]	146,000	177,000	145,000
Brazil [1]	282,000	235,000	204,000
Guiana:			
British [5]	99,000	78,000	84,000
Dutch	14,000	9,000	13,000
Peru [1]	169,000	176,000	190,000
Total	710,000	[illegible]	
EUROPE.			
Spain	20,000	[illegible]	
ASIA.			
British India [6]	2,218,000	2,451,000	2,552,000
Fed. Malay States. Perak	[7] 12,000	[7] 12,000	[7] 12,000
Formosa	268,000	179,000	72,000
Japan	65,000	68,000	[2] 68,000

Country.
CANE SUGAR—C
ASIA—continue
Java
Philippine Islan
Total
AFRICA.
Egypt
Mauritius
Natal
Portuguese Africa
Reunion [3]
Total
OCEANIA.
Australia:
Queensland
N. S. Wales
Fiji
Total
Total can sugar
BEET SUGAR.
NORTH AMERIC
U. S.: Contiguou
Canada [10]
Total
EUROPE.
Austria-Hungary
Belgium
Bulgaria [1]
Denmark
France [12]
Germany
Greece [1]
Italy [1]
Netherlands
Roumania [1]
Russia [13]
Servia [14]
Spain
Sweden
Switzerland [1]
Total
Total be sugar
Total beet Cane sug

[1] Unofficial estimate.
[2] Year preceding.

[3] Exports for calendar year in which crop year ends.

vas paid.

about 97
per cent

SUGAR—Continued.

TABLE 113.—*Total production of sugar in countries named in Table 112, 1895-6 to 1912-13.*

Year	Production	Year	Production.

[1] Prior to 1901-2, these figures include exports instead of production for British India.
[2] Preliminary.

TABLE 114.—*Production of sugar in the United States and its possessions, 1856-57 to 1913-14* [1]

[Data for 1912-13 and 1913-14: Beet sugar, also Louisiana and Hawaii cane sugar, estimated by United States Department of Agriculture; Porto Rico, by Treasury Department of Porto Rico; Philippine Islands, exports for years ending June 30. For sources of data for earlier years, see Yearbook for 1912, p. 650. A short ton is 2,000 pounds.]

Year.	Beet sugar (chiefly refined)	Cane sugar (chiefly raw).					Total.
		Louisiana	Other States.[2]	Porto Rico.	Hawaii.	Philippine Islands.	
Average:	*Short tons.*	*Short tons.*	*Short tons.*	*Short tons.*	*Short tons.*	*Short tons.*	*Short tons.*
1856-57 to 1860-61	....	132,402	5,978	75,364	....	46,446	260,190
1861-62 to 1865-66	269	74,036	1,945	71,765	....	54,488	202,503
1866-67 to 1870-71	448	44,768	3,818	96,114	....	81,485	226,633
1871-72 to 1875-76	403	67,341	4,113	87,606	(3)	119,557	279,020
1876-77 to 1880-81	470	104,920	5,327	76,579	27,040	169,007	383,403
1881-82 to 1885-86	692	124,868	7,280	87,441	76,075	189,277	485,633
1886-87 to 1890-91	1,921	163,049	8,439	70,112	126,440	186,129	555,091
1891-92 to 1895-96	19,406	268,655	6,634	63,280	162,538	286,629	807,142
1896-97 to 1900-1901	58,287	282,399	4,405	61,292	282,585	134,722	823,690
1901-2 to 1905-6	239,730	352,053	12,126	141,478	403,308	106,978	1,257,673
1906-7 to 1910-11	479,153	348,544	13,664	282,136	516,041	145,832	1,785,370
1901-2	184,606	360,277	4,048	103,152	355,611	75,011	1,082,705
1902-3	218,406	368,734	4,169	100,576	437,991	123,106	1,252,984
1903-4	240,604	255,894	22,176	138,096	367,475	82,855	1,107,100
1904-5	242,113	398,195	16,800	151,088	426,248	125,271	1,359,715
1905-6	312,920	377,162	13,440	214,480	429,213	138,645	1,485,860
1906-7	483,612	257,600	14,560	206,864	440,017	132,602	1,535,255
1907-8	463,628	380,800	13,440	230,095	521,123	167,242	1,776,328
1908-9	425,884	397,600	16,800	277,093	535,156	128,876	1,778,409
1909-10	512,469	364,000	11,200	346,786	517,090	140,783	1,892,328
1910-11	510,172	342,720	12,320	349,840	566,821	164,668	1,946,531
1911-12	599,500	352,874	8,000	371,076	595,038	205,046	2,131,754
1912-13	692,556	153,573	9,000	[4] 392,000	546,524	[4] 174,000	1,967,653
1913-14 (preliminary)	733,401	292,886	7,800	[4] 336,000	[4] 560,000	[4] 246,000	2,176,087

[1] Census returns give production of beet sugar for 1899 as 81,729 short tons; for 1904, 258,921; 1909, 501,682; production of cane sugar in Louisiana for 1839, 59,074 short tons; 1849, 226,001 hogsheads; 1859, 221,726 hogsheads; 1869, 80,706 hogsheads, 1879, 171,706 hogsheads; 1889, 146,062 short tons; 1899, 278,497 short tons; 1899, 159,583; and 1909, 325,516 short tons; cane sugar in other States, 1839, 491 short tons; in 1849, 21,576 hogsheads, in 1859, 9,256 hogsheads, in 1869, 6,337 hogsheads; in 1879, 7,166 hogsheads; in 1889, 4,580 short tons; in 1899, 1,691, and in 1909, 8,687 short tons.
[2] Includes Texas only, subsequent to 1902-3. Unofficial returns.
[3] Complete data not available for this period. Production in 1878-79, 1,264 short tons; in 1879-80, 1,204 short tons.
[4] Estimate of Willet and Gray.

SUGAR—Continued.

TABLE 115.—*Sugar-beet and beet-sugar production in the United States, 1901–1913.*

[From reports by factories to the United States Department of Agriculture.]

[1] Based upon weight of beets.
[2] Percentage of sucrose (pure sugar) in the total soluble solids of the beets.
[3] Percentage of sucrose actually extracted by factories.
[4] Percentage of sucrose (based upon weight of beets) remaining in molasses and pulp.
[5] Senate Document 22, Sixty-first Congress, first session.
[6] Compiled by the Bureau of Plant Industry, Department of Agriculture.

SUGAR—Continued.

TABLE 116.—*Wholesale price of sugar per pound, on New York market, 1899-1913.*

Date.	Raw: ovado, [illegible] polariza[illegible]on. High	Raw: Cen[illegible] 96°. Low	Refined.
1899	[illegible]	[illegible]	[illegible]
1900	[illegible]	[illegible]	[illegible]
1901	[illegible]	[illegible]	[illegible]
1902	[illegible]	[illegible]	[illegible]
1903	[illegible]	[illegible]	[illegible]
1904	[illegible]	[illegible]	[illegible]
1905	[illegible]	[illegible]	[illegible]
1906	[illegible]	[illegible]	[illegible]
1907	[illegible]	[illegible]	[illegible]
1908	[illegible]	[illegible]	[illegible]
1909	[illegible]	[illegible]	[illegible]
1910	[illegible]	[illegible]	[illegible]
1911	[illegible]	[illegible]	[illegible]
1912	[illegible]	[illegible]	[illegible]
1913.			
January	[illegible]	3.73	[illegible]
February	[illegible]	3.51	[illegible]
March	[illegible]	3.58	[illegible]
April	[illegible]	3.45	[illegible]
May	[illegible]	3.79	[illegible]
June	[illegible]	3.39	[illegible]
July	[illegible]	3.65	[illegible]
August	[illegible]	3.80	[illegible]
September	[illegible]	3.79	[illegible]
October	[illegible]	3.64	[illegible]
November	[illegible]	3.70	[illegible]
December	[illegible]	3.64	[illegible]
Year	2.62	3.80	[illegible]

TABLE 117.—*International trade in sugar, calendar years 1910–1912.*

[The following kinds and grades have been included under the head of sugar: Brown, white, candied, caramel, *chancaca* (Peru), crystal cube, maple, muscovado, *panela*. The following have been excluded: "Candy" (meaning confectionery), confectionery, glucose, grape sugar, jaggery, molasses, and sirup. See "General note," p. 375.]

EXPORTS.

[000 omitted.]

Country.	1910.	1911.	1912.	Country.
	Pounds.	*Pounds.*	*Pounds.*	
Argentina	123	150	[illegible]	Martinique
Austria-Hungary	1,486,612	1,334,958	1,[illegible]	[illegible]itius
Barbados	80,430	61,699	[illegible]	[illegible]erlands
Belgium	265,266	360,159	3[illegible]	[illegible]
Brazil	120,083	79,825	[illegible]	[illegible]ppine Islar
British Guiana	226,137	222,588	1[illegible]	[illegible]ion
British India	51,386	41,184	[illegible]	[illegible]ia
China	35,452	33,586	[illegible]	[illegible] Domingo
Cuba	3,865,742	3,148,569	3,[illegible]	[illegible]dad and
Dutch East Indies	2,033,797	2,352,302	2,[illegible]	[illegible]go
Egypt	15,067	23,817	[illegible]	[illegible]ed Kingdo
Fiji Islands	138,345	163,146	1[illegible]	[illegible]r countries
France	423,072	293,732	[illegible]	
Germany	1,543,202	1,880,096	[illegible]	Total
Guadeloupe	94,505	82,658	[illegible]	

[1] Year preceding.

[2] Preliminary.

SUGAR—Continued.

TABLE 117.—*International trade in sugar, calendar years 1910–1912*—Continued.

IMPORTS.

[000 omitted.]

Country	1910	1911	1912
		Pounds.	
Argentina			
Australia			
British India	1,		
British South Africa			
Canada			
Chile			
China			
Denmark			
Egypt			
Finland			
France			
Italy			
Japan			
Netherlands			
	13,549,385	13,830,750	14,654,841

[1] Year preceding.
[2] Data for 1909.
[3] Data for 1910.
[4] Not including receipts from Hawaii, amounting in 1910 to 1,008,719,451 pounds; 1911, 1,135,714,939; and 1912, 1,162,262,476 pounds; and from Porto Rico, in 1910, 625,982,342 pounds; 1911, 653,819,757, and 1912, 680,342,658 pounds.
[5] Data for 1908.
[6] Preliminary.

TEA.

TABLE 118.—*International trade in tea, calendar years 1910–1912.*

["Tea" includes tea leaves only, and excludes dust, sweepings, and *yerba maté*. See "General note," p. 375.]

EXPORTS.

[000 omitted.]

Country.	1910	1911	1912	Country.	1910	1911	1912
	Pounds.	*Pounds.*	*Pounds.*		*Pounds.*	*Pounds.*	*Pounds.*
British India	259,111	265,270	279,230	Japan	39,827	37,096	35,116
Ceylon	182,070	186,594	192,020	Singapore	2,117	2,676	[1] 2,676
China	207,325	194,552	196,488	Other countries	6,082	8,057	[2] 6,591
Dutch East Indies	33,813	38,409	[1] 38,409				
Formosa	22,212	25,620	23,668	Total	732,557	758,335	774,258

IMPORTS.

Country.	1910	1911	1912	Country.	1910	1911	1912
Argentina				Germany			
Australia				Netherlands			
Austria-Hungary				New Zealand			
British India				Persia			
British South Africa				Russia			
Canada				Singapore			
Chile				United Kingdom			
China				United States			
Dutch East Indies				Other countries			
France							
French Indo-China				Total			

[1] Year preceding.
[2] Preliminary.

TEA—Continued.

TABLE 119.—*Wholesale price of tea per pound, on New York market, 1899–1913.*

Date.	Foochow, fair to fine. Low.	Foochow, fair to fine. High.	Formosa, fine to choice. Low.	Formosa, fine to choice. High.	Japans, pan-fired. Low.	Japans, pan-fired. High.	India-orange pekoe. Low.	India-orange pekoe. High.	Ceylon-orange pekoe. Low.	Ceylon-orange pekoe. High.
	Cents.	*Cents.*	*Cents.*	*Cents.*	*Cents.*	*Cents.*	*Cents.*	*Cents.*	*Cents.*	*Cents.*
1899	22½	28	29	45	......	......	27	30	27	[illegible]
1900	22	28	27	46	......	......	27	30	27	[illegible]
1901	20	28	27	43	......	......	26	30	26	[illegible]
1902	21½	29	27½	47	18	23	26	35	26	[illegible]
1903	10	29	20½	50	8	33	19	35	19	[illegible]
1904	9	18	25	50	9½	14	18	25	18	[illegible]
1905	9	18	26	50	11	14	19	25	19	[illegible]
1906	8½	18	22	50	9½	16	19	25½	19	[illegible]
1907	9½	21	22	38	14½	35	15	25½	16	[illegible]
1908	12½	21	20	45	18	35	17	25	18	[illegible]
1909	12½	27	20	40	18	35	18	26	18	[illegible]
1910	10½	27	23	44½	17½	36	18	26½	18	[illegible]
1911	10	22¾	23½	45½	17	32	18	26½	18	[illegible]
1912	11½	22¾	20	39	15	21	18	25	20	[illegible]
1913.										
January	12	22	24	39	15½	35	18½	24	18½	[illegible]
February	12	22	24	39	15	35	18½	24	18½	[illegible]
March	12	22	24	39	14½	35	18½	24	18½	[illegible]
April	12	22	24	39	14½	35	18½	24	18½	[illegible]
May	12	22	24	39	13½	28	18½	21	18½	[illegible]
June	12	22	24	39	13½	28	18½	21	18½	[illegible]
July	12	22	24	39	13½	28	18½	21	18½	[illegible]
August	12	22	24	39	13½	28	18½	21	18½	[illegible]
September	12	22	24	39	13½	28	18½	21	18½	[illegible]
October	12	22	24	39	13½	28	18½	21	18½	[illegible]
November	12	22	24	39	13½	28	18½	21	18½	[illegible]
December	12	22	24	39	13½	28	18½	21	18½	[illegible]
Year	12	22	24	39	13½	35	18½	24	18½	[illegible]

COFFEE.

TABLE 120.—*International trade in coffee, calendar years 1910–1912.*

[The item of coffee comprises unhulled and hulled, roasted, ground, or otherwise prepared, but imitation or "surrogate" coffee and chicory are excluded. See "General note," p. 375.]

EXPORTS.

[000 omitted.]

Country.	1910	1911	1912
	Pounds.	*Pounds.*	*Pounds.*
Belgium	28,531		53,036
Brazil	[illegible]		1,597,950
British India	[illegible]		34,937
Colombia	000		123,442
Costa Rica	503		26,980
Dutch East Indies	[illegible]901		[2] 32,517
Guatemala	891		82,855
Haiti	425		80,812
Jamaica	783		10,034
Mexico		41,587	53,759
Netherlands	173,828	195,902	180,732
Nicaragua	26,371	[3] 26,371	[4] 26,371
Salvador	62,701	[3] 65,367	59,210
Singapore	3,965	4,365	[4] 4,365
United States [5]	47,159	38,384	46,710
Venezuela	96,655	97,659	117,042
Other countries	31,038	62,961	[6] 64,385
Total	2,150,890	2,386,173	2,618,707

[1] Unofficial estimate.
[2] Year preceding.
[3] Estimated from data furnished by Haitian legation. Year beginning Oct. 1.
[4] Data for 1910.
[5] Chiefly from Porto Rico.
[6] Preliminary.

COFFEE—Continued.

TABLE 120.—*International trade in coffee, calendar years 1910–1912*—Continued.

IMPORTS.

[000 omitted.]

¹ Year preceding.

² Preliminary.

TABLE 121.—*Wholesale price of coffee per pound, on the New York and New Orleans markets, 1899–1913.*

Date.
1899
1900
1901
1902
1903
1904
1905
1906
1907
1908
1909
1910
1911
1912
1913
January
February
March
April
May
June
July
August
September
October
November
December
Year

OIL CAKE AND OIL-CAKE MEAL.

TABLE 122.—*International trade in oil cake and oil-cake meal calendar years, 1910–1912.*

[The class called here "oil cake and oil-cake meal" includes the edible cake and meal remaining after making oil from such products as cotton seed, flaxseed, peanuts, corn, etc. See "General note," p. 375.]

EXPORTS.

[000 omitted.]

IMPORTS.

[1] Preliminary. [2] Year preceding.

ROSIN.

TABLE 123.—*International trade in rosin, calendar years 1910–1912.*

[For rosin, only the resinous substance known as "rosin" in the exports of the United States, is taken. See "General note," p. 375.]

EXPORTS.

[000 omitted.]

Country.	1910	1911	1912	Country.	1910	1911	1912
	Pounds	*Pounds.*	*Pounds.*		*Pounds.*	*Pounds.*	*Pounds.*
Austria-Hungary	2,031	1,988	2,388	Spain	22,560	19,509	25,069
Belgium	....	46,346	60,312	United States	635,415	676,323	690,777
Germany	55,682	52,354	37,609	Other countries	722	325	[3] 2,198
Greece	12,335	17,202	14,061				
Netherlands	55,814	62,976	61,698	Total	823,113	924,340	933,297
Russia	38,545	47,317	49,196				

IMPORTS.

[1] Preliminary. [2] Data for 1909. [3] Year preceding. [4] Data for [illegible].

TURPENTINE.

TABLE 124.—*International trade in spirits of turpentine, calendar years 1910–1912.*

["Spirits of turpentine" includes only "spirits" or "oil" of turpentine and, for Russia, *skipidar;* it excludes crude turpentine, pitch, and, for Russia, *terpentin.* See "General note," p. 375.]

EXPORTS.

[000 omitted.]

Country.	1910	1911	1912	Country	1910	1911	1912
	Gallons.	*Gallons*	*Gallons.*		*Gallons.*	*Gallons.*	*Gallons.*
Belgium	....	2,157	1,871	Spain	1,170	1,126	1,606
France	2,851	2,657	2,071	United States	14,252	18,198	20,811
Germany	429	420	494	Other countries	591	712	[1]783
Netherlands	1,812	2,288	3,471				
Russia	2,473	2,698	3,225	Total	23,578	30,257	33,736

IMPORTS.

Country.	1910	1911	1912	Country	1910	1911	1912
Argentina	435	617	607	New Zealand	137	241	[2]241
Australia	406	859	641	Russia	235	275	281
Austria-Hungary	2,503	2,518	2,775	Sweden	122	131	[2]131
Belgium	....	3,612	3,054	Switzerland	419	441	466
Canada	1,045	1,123	1,315	United Kingdom	7,041	7,154	9,837
Chile	169	261	226	Other countries	800	1,351	[1]1,396
Germany	8,660	8,367	9,325				
Italy	856	967	993	Total	25,584	31,392	36,236
Netherlands	2,698	3,475	4,970				

[1] Preliminary. [2] Year preceding.

INDIA RUBBER.

TABLE 125.—*International trade in india rubber, calendar years 1910–1912.*

[Figures for india rubber include "india rubber," so called, and *caoutchouc, caucho, jebe* (Peru), *hule* (Mexico), *borracha, massaranduba, mangabeira, maniçoba, sorva* and *seringa* (Brazil), *gomelastiek* (Dutch East Indies), *caura, sernambi* (Venezuela). See "General note," p. 375.]

EXPORTS.

[000 omitted.]

Country	1910	1911	1912
Angola	[illegible]	[illegible]	[illegible]
Belgian Kongo	[illegible]	[illegible]	[illegible]
Belgium	[illegible]	[illegible]	[illegible]
Bolivia	[illegible]	[illegible]	[illegible]
Brazil	[illegible]	[illegible]	[illegible]
Dutch East In[illegible]	[illegible]	[illegible]	[illegible]
Ecuador	[illegible]	[illegible]	[illegible]
France	[illegible]	[illegible]	[illegible]
French Guinea	[illegible]	[illegible]	[illegible]
French Kongo	[illegible]	[illegible]	[illegible]
Germany	[illegible]	[illegible]	[illegible]
Gold Coast	[illegible]	[illegible]	[illegible]

IMPORTS.

Country	1910	1911	1912	Country	1910	1911	1912
Austria-Hungary	6,156	6,763	7,841	Russia	16,201	14,894	20,620
Belgium	23,316	24,657	30,138	United Kingdom	45,819	37,488	41,942
Canada	2,967	3,700	5,498	United States	90,139	82,852	117,972
France	32,080	34,945	37,080	Other countries	9,323	12,796	[1]12,660
Germany	41,238	44,002	45,385				
Italy	4,142	5,335	7,704	Total	279,267	277,711	338,696
Netherlands	7,886	10,280	11,856				

[1] Year preceding. [2] Preliminary.

SILK.

Table 126.—*Production of raw silk in countries named, 1908–1912.*

[Estimates of the Silk Manufacturers' Association, and the Silk Merchant's Union, of Lyon, France.

[1] Preliminary.

Table 127.—*Total production of raw silk in countries named in Table 126, 1900–1912.*

Year.	Production	Year	Production.	Year.	Production.
	Pounds.		*Pounds.*		*Pounds.*
1900	40,724,000	1905	41,513,000	1909	54,023,000
1901	42,393,000	1906	46,106,000	1910	54,002,000
1902	41,368,000	1907	48,634,000	1911	54,167,000
1903	39,981,000	1908	53,087,000	1912 [1]	58,951,000
904	45,195,000				

WOOD PULP.

TABLE 128.—*International trade in wood pulp, calendar years 1910–1912.*

[All kinds of pulp from wood have been taken for this item, but no pulp made from other fibrous substances. See "General note," p. 375.]

EXPORTS.

[000 omitted.]

Country.	1910	1911	1912	Country.	1910	1911	1912
	Pounds.	*Pounds.*	*Pounds.*		*Pounds.*	*Pounds.*	*Pounds.*
Austria-Hungary	194,808	218,781	214,074	Sweden	1,682,833	1,868,461	[1] 1,868,461
Belgium	82,609	95,276	91,291	Switzerland	13,013	13,408	13,109
Canada	657,956	519,028	696,203	United States	16,722	18,968	28,379
Finland	191,272	251,912	[1] 251,912	Other countries	7,078	108,697	[2] 106,332
Germany	388,760	378,484	402,769				
Norway	1,401,685	1,369,248	1,520,091	Total	4,701,623	4,897,543	5,251,687
Russia	63,987	55,260	48,066				

IMPORTS.

[1] Year preceding. [2] Preliminary.

FARM ANIMALS AND THEIR PRODUCTS.

TABLE 129.—*Live stock of countries named.*

[Africa incompletely represented, through lack of statistics for large areas. Number of animals in China, Persia, Afghanistan, Chosen, Bolivia, Ecuador, and several less important countries unknown. For Brazil number of cattle alone estimated, but roughly. In general, statistics of cattle, horses, sheep, and swine much more complete than those of other animals, as statements for the world.]

[000 omitted.]

Country.	Year.	Cattle.	Swine.	Sheep.	Goats.	Horses.	Mules.	Asses.	Buffaloes.	Camels.
NORTH AMERICA.										
United States:										
Contiguous—		*No.*	*No.*	*No.*	*No.*	*No.*	*No.*	*No.*	*No.*	*No.*
On farms	1914	56,592	58,933	49,719	[1] 2,915	20,962	4,449	[1] 106	....	....
Not on farms	1910	1,879	1,288	391	115	3,183	270	17	....	....
Noncontiguous—										
Alaska	1910	1	(²)	(²)	(²)	2	(²)	(²)	....	....
Hawaii	1910	149	31	77	5	28	9	3	(²)	....
Porto Rico	1910	316	106	6	49	58	5	1	....	....
Total United States (except Philippine Islands)	......	58,937	60,358	50,193	3,084	24,233	4,733	127	....	....
Canada:										
Prince Edward Island	1913	113	44	86	....	36	....	....	....	....
Nova Scotia	1913	284	56	218	....	63	....	....	....	....
New Brunswick	1913	215	77	135	....	65	....	....	....	....
Quebec	1913	1,455	662	608	....	370	....	....	....	....
Ontario	1913	2,601	1,652	706	....	905	....	....	....	....
Manitoba	1913	410	185	43	....	304	....	....	....	....
Saskatchewan	1913	663	387	115	....	590	....	....	....	....
Alberta	1913	779	351	178	....	485	....	....	....	....
British Columbia	[illegible]	136	34	45	....	60	....	....	....	....
Total Canada	1913	6,656	3,448	2,129	....	2,866	....	....	....	....

[1] 1910. [2] Less than 500.

TABLE 129.—*Live stock of countries named*—Continued.

[000 omitted.]

Country.	Year.	Cattle.	Swine.	Sheep.	Goats.	Horses.	Mules.	Asses.	Buffaloes.	Camels.
NORTH AMERICA—con.										
Central America:		*No.*	*No.*	*No.*	*No.*	*No.*	*No.*	*No.*	*No.*	*No.*
Costa Rica	1910	333	70	1	1	60	3	(1)	...	...
Guatemala	1899	197	30	78	...	50	...	...	...	...
Honduras	1912	420	118	5	6	88	15	4	...	...
Nicaragua	1908	252	12	(1)	1	28	6	1	...	...
Panama	1907	65	28	...	3	17	2	(1)	...	...
Salvador	1908	284	423	21	...	74	...	...	...	...
Mexico	1902	5,142	616	3,424	4,206	859	334	288	...	...
Newfoundland	1911	30	27	98	[2] 17	14	...	...	...	...
West Indies	...	2,971	404	59	105	627	46	14	...	...
SOUTH AMERICA.										
Argentina	1911	28,786	2,900	80,401	4,302	8,894	535	319	...	...
Bolivia	1910	734	114	1,449	468	97	45	173	...	...
British Guiana	1912	72	17	18	[3] 11	2	...	...	...	...
Chile	1912	1,760	166	4,169	273	421	37	33	...	...
Colombia	...	2,800	2,300	746	361	341	257	...	...	...
Dutch Guiana	1910	7	3	(1)	3	(1)	(1)	1	...	...
Falkland Islands	1912	8	(1)	711	...	4	...	...	...	...
French Guiana	1911	4	...	...	...	...	...	...	...	...
Paraguay	1912	3,000	24	214	32	183	8	...	...	...
Uruguay	1908	8,193	180	26,286	20	556	18	4	...	...
Venezuela	1899	2,004	1,618	177	1,667	191	89	313	...	...
EUROPE.										
Austria-Hungary:										
Austria	1910	9,160	6,432	2,429	1,254	1,801	21	53	...	...
Hungary (proper)	1911	6,184	6,417	7,698	331	2,001	[4] 19	...	...	...
Croatia-Slavonia	1911	1,135	1,164	850	96	350	[4] 3	...	...	...
Bosnia-Herzegovina	1910	1,309	527	2,500	1,393	222	(1)	6	1	...
Total, Austria-Hungary	...	17,788	14,540	13,477	3,074	4,374	43	...	...	...
Belgium	1912	1,831	1,349	...	...	263	...	...	...	...
Bulgaria	1911	2,018	527	8,632	1,459	478	12	118	477	...
Denmark	1909	2,254	1,468	727	40	535	...	...	...	...
Finland	1910	1,573	418	1,309	13	361	...	...	...	...
France	1912	14,706	6,904	16,468	1,409	3,222	196	359	...	...
Germany	1912	20,182	21,924	5,803	3,410	4,523	2	11	...	...
Greece	1912	400	80	4,000	3,339	160	88	141	...	...
Iceland	1911	26	...	574	1	44	...	...	...	...
Italy	1908	6,199	2,508	11,163	2,715	956	388	850	19	...
Luxemburg	1913	101	136	5	10	19	(1)	...	...	...
Malta	1912	4	4	15	[3] 18	[5] 9	...	[6] 3	...	...
Netherlands	1910	2,027	1,260	889	224	327	...	...	...	...
Norway	1907	1,094	319	1,393	296	172	...	...	...	...
Portugal	1906	703	1,111	3,073	1,034	88	58	144	...	...
Roumania	1911	2,667	1,021	5,269	297	825	[4] 4	...	...	...
Russia:										
Russia (proper)	1910	31,315	12,049	40,734	857	21,868	4	(1)	3	304
Poland	1910	2,301	612	1,050	9	1,222	(1)	(1)	...	...
Northern Caucasia	1910	2,686	860	6,392	313	1,562	...	...	...	...
Total, European Russia	1910	36,302	13,521	48,176	1,179	24,652	...	...	...	...
Servia	1910	958	864	3,809	627	153	(1)	[6] 1	7	...
Spain	1912	2,562	2,571	15,830	3,116	526	929	829	...	4
Sweden	1911	2,690	951	946	66	588	...	...	...	...
Switzerland	1911	1,443	569	160	340	144	...	...	...	...
Turkey, European	1910	6,726	21	21,190	12,216	1,042	202	1,556	763	464
United Kingdom:										
England and Wales	1913	5,717	2,102	17,130	...	1,402	...	...	...	...
Scotland	1912	1,179	159	6,902	...	205	...	...	...	...
Ireland	1913	4,933	1,060	3,621	246	614	30	243	...	...
Isle of Man and Channel Islands	1912	40	13	81	...	10	...	...	...	...
Total, United Kingdom	...	11,869	3,334	27,824	...	2,231	...	...	...	...

[1] Less than 500.
[2] 1901.
[3] 1911.
[4] Includes asses.
[5] Includes mules and asses.
[6] Includes mules.

TABLE 129.—*Live stock of countries named*—Continued.

[000 omitted.]

Country.	Year.	Cattle.	Swine.	Sheep.	Goats.	Horses.	Mules.	Asses.	Buffaloes.	Camels.
ASIA.										
British India:		*No.*	*No.*	*No.*	*No.*	*No.*	*No.*	*No.*	*No.*	*No.*
British Provinces....	1911	103,595	....	23,280	30,900	1,565	113	1,342	17,063	447
Native States........	1911	11,281	....	[1] 8,411	....	146	......	166	1,694	59
Total, British India..........	......	114,876	....	31,691	....	1,711	......	1,508	18,757	506
Ceylon................	1912	1,465	86	90	[2] 171	5	......	......	[5] 579	....
Cochin China...........	1911	310	26	(3)	2	11	(3)	......	....	....
Cyprus....	1912	61	40	256	[4] 271	69	......	......	....	1
Dutch East Indies:										
Java and Madura....	1905	2,655	....	....	....	364	......	......	2,187	....
Other............ ..	1905	449	....	....	....	119	......	......	447	....
Total, Dutch East Indies....	......	3,104	....	....	....	483	......	......	2,634	....
Formosa..............	1910	176	1,308	....	137	(3)	......	......	304	....
French Indo-China....	1911	44	....	10	24	....	......	......	....	....
Hongkong............	1912	1	....	....	(3)	(3)	......	......	....	....
..	1912	1,399	309	3	101	1,582	......	......	....	....
..	......	5	....	....	....	....	......	......	....	....
..	1913	388	1,822	103	515	182	......	......	1,048	....
Russia (28 governments):										
Central Asia.........	1910	5,633	155	20,008	2,741	5,119	......	......	....	[8] 365
Siberia..............	1910	5,971	1,369	5,470	342	4,697	......	......	....	[8] 1
Transcaucasia.	1910	3,498	324	6,846	766	444	......	[8] 122	[8] 338	[8] 17
Total, Asiatic Russia........	1910	15,102	1,848	32,324	3,849	10,260	......	......	....	....
Siam.................	......	1,628	....	....	....	58	......	......	1,628	....
Straits Settlements and Labuan........	1912	39	145	....	....	3	......	......	....	....
Turkey, Asiatic.......	......	3,000	....	45,000	9,000	800	......	2,500	....	....
AFRICA.										
....	1911	1,114	110	8,529	[7] 3,682	227	192	[7] 279	....	199
....	1911	437	(3)	1,369	2	88	......	(3)	....	....
....	1912	775	3	6,500	[4] 4,000	1	......	......	....	....
Dahomey............	1911	119	....	196	137	1	......	(3)	....	....
....	1912	[redacted]	....	....	....	47	21	691	682	....
....	1905	251	....	394	....	1	29	......	....	47
....	1911	382	....	128	138	3	(3)	1	....	....
....	1911	(3)	....	10	45	(3)	......	(3)	....	....
....	1907	83	....	....	....	4	......	......	....	....
..	1905	523	1	1,560	1,820	(3)	(3)	9	....	(3)
Africa...............	1909	96	3	301	[7] 409	8	5	5	....	[6] 1
Ivory Coast...........	1911	92	1	92	142	....	......	(3)	....	....
Madagascar...........	1911	5,330	543	352	97	2	1	(3)	....	....
Mauritius.	1912	19	6	1	[6] 5	(3)	......	......	....	....
Mayotte and dependencies	1911	34	....	(3)	27	(3)	(3)	(3)	....	....
Nyasaland Protectorate	1912	63	22	23	[4] 112	(3)	......	......	....	....
Reunion............ .	1911	5	1	2	4	(3)	1	(3)	....	....
Rhodesia.......	1911	500	....	300	602	....	......	......	....	....
St. Helena............	1911	1	(3)	4	1	(3)	......	1	....	....
.	1911	665	....	206	428	36	(3)	40	....	12
.	1912	1	6	(3)	[2] 1	(3)	......	......	....	....
.	1910	2	(3)	1	....	(3)	......	......	....	....
.	1911	(3)	....	(3)	(3)	(3)	......	(3)	....	(3)
.	1910	585	....	175	....	....	......	......	....	....
gos)................	1902	2	2	2	3	(3)	......	19	....	....
Sudan (Anglo-Egyptian)...............	1909	245	....	[illegible]	977	3	......	121	....	23
Swaziland............	1912	58	9	164	[4] 60	1	......	......	....	....
Tunis................	1912	225	19	767	492	37	22	192	.....	[redacted]
Uganda Protectorate..	1912	732	....	501	....	(3)	......	......	....	....

[1] Including goats. [2] 1909. [3] Less than 500. [4] 1911. [5] 1908. [6] 1902. [7] 1912. [8] 1910.

TABLE 129.—*Live stock of countries named*—Continued.

[000 omitted.]

[1] 1905. [2] 1910. [3] 1911. [4] Less than 500.

TABLE 130.—*International trade in hides and skins, calendar years 1910–1912*

[This table gives the classification as found in the original returns, and the summary statements for "A[ll] countries" represent the total for each class only so far as it is disclosed in the original returns. Th[e] following kinds are included: Alligator, buffalo, calf, camel, cattle, deer, goat and kid, horse and co[lt], kangaroo, mule and ass, sheep and lamb, and all other kinds except furs, bird skins, sheepskins wi[th] wool on, skins of rabbits and hares, and tanned or partly tanned hides and skins. See "General note," p. 375.]

EXPORTS.

[000 omitted.]

[1] Included in unclassified. [2] Less than 500 pounds. [3] Unofficial estimate.

TABLE 130.—*International trade in hides and skins, calendar years 1910–1912*—Contd.

EXPORTS.

IMPORTS

Austria-Hungary:				Austria-Hungary—Continued.			
Calf, dried	763	1,690	916	Horse, green	456	[illegible]	169
Calf, green	1,828	1,678	1,256	Kid	372	426	489
Cattle, dried	31,480	43,970	37,877	Lamb	11,608	10,193	10,[illegible]
Cattle, green	27,987	42,488	35,006	Sheep	3,492	3,813	3,027
Goat	1,333	1,366	1,214	Unclassified	828	609	715
Horse, dried	117	86	73				

[1] Year preceding.
[2] Number of pounds computed from stated number of hides and skins.
[3] Less than 500 pounds.
[4] Data for 1910.

TABLE 130.—*International trade in hides and skins, calendar years 1910–1912*—Contd

IMPOR

[1] Year preceding.
[2] Included in cattle, green.
[3] Includes buffalo hides.
[4] Less than 500 pounds.
[5] Includes calf for 1912.
[6] Number of pounds computed from stated number of skins.

.31.—*Number of animals on farms and* *of the United States, as reported by the*

HORSES AND MULES.

and value of horses and mules on farms in the United States, 1867–1914.

[1] Estimates of numbers revised, based on census data.

HORSES AND MULES—Continued.

TABLE 133.—*Number and value of horses and mules on farms, by States, Jan. 1, 1913 1914.*

HORSES AND MULES—Continued.

TABLE 134.—*Imports, exports, and prices of horses and mules, 1892–1913.*

Year ending June 30—	Imports of horses.			Exports of horses.			Exports of mules.		
	Number.	Value.	Average import price.	Number.	Value.	Average export price.	Number.	Value.	Average export price.
1892	14,074	$2,455,868	$174.50	3,226	$611,188	$189.46	1,965	$238,591	$121.42
1893	15,451	2,388,267	154.57	2,967	718,607	242.20	1,634	210,278	128.69
1894	6,166	1,319,572	214.01	5,246	1,108,995	211.40	2,063	240,961	116.80
1895	13,098	1,055,191	80.56	13,984	2,209,298	157.99	2,515	186,452	74.14
1896	9,991	662,591	66.32	25,126	3,530,703	140.52	5,918	406,161	68.63
1897	6,998	464,808	66.42	39,532	4,769,265	120.64	7,473	545,331	72.97
1898	3,085	414,899	134.49	51,150	6,176,569	120.75	8,098	664,789	82.09
1899	3,042	551,050	181.15	45,778	5,444,342	118.93	6,755	516,908	76.52
1900	3,102	596,592	192.32	64,722	7,612,616	117.62	43,369	3,919,478	90.38
1901	3,785	985,738	260.43	82,250	8,873,845	107.89	34,405	3,210,267	93.31
1902	4,832	1,577,234	326.41	103,020	10,048,046	97.53	27,586	2,692,298	97.60
1903	4,999	1,536,296	307.32	34,007	3,152,159	92.69	4,294	521,725	121.47
1904	4,726	1,460,287	308.99	42,001	3,189,100	75.93	3,658	412,971	112.90
1905	5,180	1,591,083	307.16	34,822	3,175,259	91.19	5,826	645,464	110.79
1906	6,021	1,716,675	285.11	40,087	4,365,981	108.91	7,167	989,639	138.08
1907	6,080	1,978,105	325.35	33,882	4,359,957	131.99	6,781	850,901	125.48
1908	5,487	1,604,392	292.40	19,000	2,612,587	137.50	6,609	990,667	149.90
1909	7,084	2,007,276	283.35	21,616	3,386,617	156.67	3,432	472,017	137.53
1910	11,620	3,296,022	283.65	28,910	4,081,157	141.17	4,512	614,094	136.18
1911	9,593	2,692,074	280.63	25,145	3,845,253	152.92	6,585	1,070,051	162.50
1912	6,607	1,923,025	291.06	34,828	4,764,815	136.81	4,901	732,095	149.30
1913	10,008	2,125,875	212.42	28,707	3,960,102	137.95	4,744	733,795	154.68

CATTLE.

TABLE 135.—*Imports, exports, and prices of live cattle, 1892–1913.*

Year ending June 30—	Imports.			Exports.		
	Number.	Value.	Average import price.	Number.	Value.	Average export price.
1892	2,168	$47,466	$21.89	394,607	$35,099,095	$88.95
1893	3,293	45,682	13.87	287,094	26,032,428	90.68
1894	1,592	18,704	11.75	359,278	33,461,922	93.14
1895	149,781	765,853	5.11	331,722	30,603,796	92.26
1896	217,826	1,509,856	6.93	372,461	34,560,672	92.79
1897	328,977	2,589,857	7.87	392,190	36,357,451	92.70
1898	291,589	2,913,223	9.99	439,255	37,827,500	86.12
1899	199,752	2,320,362	11.62	389,490	30,516,833	78.35
1900	181,006	2,257,694	12.47	397,286	30,635,153	77.11
1901	146,022	1,931,433	13.23	459,218	37,566,980	81.81
1902	96,027	1,608,722	16.75	392,884	29,902,212	76.11
1903	66,175	1,161,548	17.55	402,178	29,848,936	74.22
1904	16,056	310,737	19.35	593,409	42,256,291	71.21
1905	27,855	458,572	16.46	567,806	40,598,048	71.50
1906	29,019	548,430	18.90	584,239	42,081,170	72.03
1907	32,402	565,122	17.44	423,051	34,577,392	81.73
1908	92,356	1,507,310	16.32	349,210	29,339,134	84.02
1909	139,184	1,999,422	14.37	207,542	18,046,976	86.96
1910	195,938	2,999,824	15.37	139,430	12,200,154	87.50
1911	182,923	2,953,077	16.14	150,100	13,163,920	87.70
1912	318,372	4,805,574	15.09	105,506	8,870,075	84.07
1913	421,649	6,640,668	15.75	24,714	1,177,199	47.63

CATTLE—Continued.

TABLE 136.—*Number and value of milch cows and other cattle on farms in the United States, 1867–1914.*

NOTE.—*Figures in italics* are census returns; culture. Estimates of numbers are to the published numbers of the estimates whenever new census giving numbers as of Apr. 15, is not June 1.

are estimates of the Department of Agriculture percentages of increase or decrease base is used for applying percentage observed that the census of 1910, censuses, which related to numbers

January 1	Numb
1867	8,349
1868	8,692
1869	9,248
1870	10,096
1870, census, June 1	*8,935*
1871	10,023,
1872	10,304,
1873	10,576,
1874	10,705,
1875	10,907
1876	11,085,
1877	11,261
1878	11,300,
1879	11,826,
1880	12,027
1880, census, June 1	*12,443*
1881	12,369
1882	12,612
1883	13,126,
1884	13,501
1885	13,905,
1886	14,235,
1887	14,522,
1888	14,856,
1889	15,298
1890	15,953,
1890, census, June 1	*16,511*
1891	16,020
1892	16,416,
1893	16,424,
1894	16,487
1895	16,505
1896	16,138
1897	15,942,
1898	15,841,
1899	15,990,
1900	16,292,
1900, census, June 1	*17,135,*
1901 [1]	16,834,
1902	16,697
1903	17,105,
1904	17,420,
1905	17,572,
1906	19,794,
1907	20,968,
1908	21,194,
1909	21,720
1910	21,801
1910, census, Apr. 15	*20,625*
1911 [1]	20,823,
1912	20,699
1913	20,497
1914	20,737

[1] Estimates of numbers revised, based on census data.

CATTLE—Continued.

TABLE 137.—*Number and value of cattle on farms, by States, Jan. 1, 1913 and 1914.*

27306°—YBK 1913——30

CATTLE—Continued.

TABLE 138.—*Wholesale price of cattle per 100 pounds, 1899–1915.*

BUTTER.

TABLE 139.—*Wholesale price of butter per pound, 1899–1913.*

TABLE 140.—*International trade in butter, calendar years, 1910–1912.*

[Butter includes all butter made from milk, melted and renovated butter, but does not include margarine cocoa butter, or ghee. See "General note," p. 375.]

EXPORTS.

[000 omitted.]

IMPORTS.

[1] Year preceding. [2] Preliminary.

BUTTER AND EGGS.

TABLE 141.—*Average price received by farmers on the first of each month of 1913.*

BUTTER AND EGGS—Continued.

Table 141.—*Average price received by farmers on the first of each month of 1913—C*

BUTTER.

EGGS.

Table 142.—*Receipts of butter at seven leading markets in the United States, 1891–19*

[From Board of Trade, Chamber of Commerce, and Merchants' Exchange Reports.]

[000 omitted.]

Year.	Boston.	Chicago.	Milwaukee.	St. Louis.	San Francisco.	Total 5 cities.	Cincinnati.	New York
Averages:	*Pounds.*	*Pounds.*	*Pounds.*	*Pounds.*	*Pounds.*	*Pounds.*	*Packages.*	*Packa*
1891–1895	40,955	146,225	3,996	13,944	15,240	219,360	88	1,
1896–1900	50,790	232,289	5,096	14,582	14,476	317,234	157	2,
1901–1905	57,716	245,203	7,164	14,685	15,026	339,793	177	2,
1906–1910	66,612	286,518	8,001	17,903	13,581	392,615	169	2,
1901	57,500	253,809	5,590	13,477	14,972	345,348	238	2,
1902	54,574	219,233	7,290	14,573	14,801	310,471	223	1,
1903	54,347	232,032	6,857	14,080	13,570	320,886	121	2,
1904	55,435	249,024	7,993	15,727	14,336	342,515	147	2,
1905	66,725	271,915	8,091	15,566	17,450	379,747	155	2,
1906	65,152	248,848	8,209	13,196	9,282	344,489	205	2,
1907	63,589	263,715	8,219	13,453	16,725	365,701	187	2,
1908	69,843	316,885	8,796	18,614	13,528	427,478	166	2,
1909	65,054	284,547	7,458	21,086	14,449	392,594	150	2,
1910	69,421	318,986	7,319	23,163	13,922	432,811	[illegible]	2,
1911	63,674	334,932	8,632	24,839	17,606	449,683	162	2,
1912	72,109	286,213	7,007	20,521	28,172	414,022	109	2,
1913	70,737	277,651	9,068	24,726	23,122	405,304	103	2,
1913.								
January	2,314	12,913	592	1,873	1,726	19,418	9	
February	2,871	13,180	520	2,009	1,454	20,034	5	
March	3,363	15,915	669	1,996	1,964	23,907	11	
April	4,434	18,505	753	2,015	2,711	28,418	7	
May	7,694	26,185	1,014	2,184	2,703	39,780	8	
June	12,939	46,070	1,101	2,501	2,106	64,717	10	
July	12,323	39,030	862	2,595	1,711	56,521	11	
August	8,333	30,426	869	1,852	2,594	44,074	9	
September	6,097	24,915	801	1,861	1,479	35,153	6	
October	4,242	22,699	747	1,914	1,538	31,140	8	
November	2,876	15,343	506	1,791	1,433	21,949	9	
December	3,251	12,470	634	2,135	1,703	20,193	10	

BUTTER AND EGGS—Continued.

TABLE 143.—*Receipts of eggs at seven leading markets in the United States, 1891-1913.*

[From Board of Trade, Chamber of Commerce, and Merchants' Exchange Reports.]

Year.	Boston.	Chicago.	Cincinnati.	Milwaukee.	New York.	St. Louis.	San Francisco.	Total.
	Cases.	*Cases.*	*Cases.*	*Cases.*	*Cases.*	*Cases.*	*Cases.*	*Cases.*
Averages:								
1891-1895	722,363	1,879,065	288,548	90,943	2,113,946	557,320	166,059	5,818,244
1896-1900	912,807	2,196,631	362,262	113,327	2,664,074	852,457	194,087	7,295,645
1901-1905	1,155,340	2,990,675	418,842	139,718	3,057,298	1,000,935	304,933	9,067,741
1906-1910	1,517,995	4,467,040	509,017	180,362	4,046,360	1,304,719	334,766	12,360,259
1901	1,040,555	2,783,709	493,218	128,179	2,909,194	1,022,646	277,500	8,655,001
1902	1,053,165	2,659,340	464,799	114,732	2,743,642	825,999	285,058	8,146,735
1903	1,164,777	3,279,248	338,327	129,278	2,940,091	959,648	335,228	9,146,597
1904	1,122,819	3,113,858	377,263	166,409	3,215,924	1,216,124	319,637	9,532,034
1905	1,395,385	3,117,221	420,604	159,990	3,477,638	980,257	307,243	9,858,338
1906	1,709,531	3,583,878	484,208	187,561	3,981,013	1,023,125	137,074	11,106,390
1907	1,594,576	4,780,356	588,636	176,826	4,262,153	1,288,977	379,430	13,070,963
1908	1,436,786	4,569,014	441,072	207,558	3,703,990	1,439,868	347,436	12,145,724
1909	1,417,397	4,557,906	519,652	160,418	3,903,867	1,395,987	340,185	12,295,412
1910	1,431,686	4,844,045	511,519	169,448	4,380,777	1,375,638	469,698	13,182,811
1911	1,441,748	4,707,335	605,131	175,270	5,021,757	1,736,915	587,115	14,275,271
1912	1,580,106	4,556,643	668,942	136,621	4,723,558	1,391,611	638,920	13,696,401
1913	1,589,399	4,593,800	594,954	187,931	4,666,117	1,397,962	574,222	13,604,385
1913.								
January	49,343	134,863	21,513	4,994	194,642	62,474	40,844	508,673
February	64,679	169,348	27,034	4,792	257,679	98,929	62,699	685,160
March	111,180	387,526	71,121	16,321	447,250	170,527	77,228	1,281,15[illegible]
April	263,209	856,135	127,587	33,850	679,102	185,446	73,309	2,218,63[illegible]
May	388,885	862,679	123,251	41,664	709,612	203,246	61,090	2,390,4[illegible]
June	275,821	658,534	53,767	25,057	605,024	192,654	52,556	1,863,41[illegible]
July	139,984	508,515	42,845	14,879	455,366	139,313	43,922	1,344,8[illegible]
August	109,185	358,402	29,267	14,342	342,536	105,870	40,555	1,000,15[illegible]
September	82,806	286,899	17,018	11,939	332,170	77,101	83,751	841,68[illegible]
October	50,986	198,133	30,361	9,789	288,851	58,768	30,946	667,83[illegible]
November	22,984	99,257	20,052	5,359	169,300	59,758	26,436	405,14[illegible]
December	30,337	73,509	31,138	4,945	184,585	43,876	30,887	399,2[illegible]

BUTTER AND EGGS—Continued.

TABLE 144.—*Wholesale price of eggs per dozen, 1899–1913.*

Date.	Chicago. Fresh.		Cincinnati.		St. Louis. Average best fresh.		Milwaukee. Fresh.		New York. Average best fresh.	
	Low.	High.	Low.	High.	Low.	High.	Low.	High.	Low.	High.
	Cents.	*Cents.*	*Cents.*	*Cents.*	*Cents.*	*Cents.*	*Cents.*	*Cents.*	*Cents.*	*Cents.*
1899	10	35	8½	24	9	22	10	30	12½	35
1900	10	26	9	22	8	23	10	24	12	29
1901	10	28	9	27	6	25	10	24	13	31
1902	13¾	32½	13	32	11½	32	13½	30	15½	37
1903	10	30	12	28	11	28½	12½	27	15	45
1904	11	34½	14½	32	13	29	13½	32	16	47
1905	12	36	14	30	10½	34	14	31	16½	40
1906	11	36	13	29	11½	26	12½	33	14½	45
1907	13	30	13½	29	12	25½	13½	28	16	50
1908	14	33	13	36	12½	29	13	32	15	55
1909	17½	36½	17	37	16	40	14	34	19	55
1910	15	36	17	40	14½	35	10	30	22	55
1911	12	32	12½	39	11	29	11	32	17	60
1912	17	40	17	40	14½	39	15	38	20½	60
1913.										
January	22	27½	21½	27½	21	25	19	25	27	40
February	17½	24¾	18	23½	17½	23	18	23	21	32
March	17	20	16	20	16	19	16	18½	20	31
April	16½	18½	15½	18	15½	17	15½	17	20	29
May	17½	18½	17½	19	17	17½	16½	17	21	25
June	17	18½	18	19	14½	17	14	17	23	26
July	16	19	18½	19½	14½	17	13	17	25	33
August	19	[illegible]	18½	24½	14	17	14½	20	27	36
September	22½	[illegible]	25	28	12	24	18	24	30	46
October	25	[illegible]	26	33½	23	29½	21	30	32	55
November	20	35	35	41	28	35	27	35	36	65
December	30½	37	30	42	27½	32	28	35	35	63
Year	16	37	15½	42	12	35	13	35	20	65

CHEESE.

TABLE 145.—*International trade in cheese, calendar years 1910–1912*

[Cheese includes all cheese made from milk; "cottage cheese," of course, is included. See "General note," p. 375.]

EXPORTS.

[000 omitted.]

IMPORTS.

[1] Year preceding.

[2] Preliminary.

CHICKENS.

TABLE 146.—*Average price per pound received by farmers on first of month indicated.*

SHEEP AND WOOL.

BLE 147.—*Number and value of sheep on farms in the United States, 1867–1914.*

**TE.—Figures in *italics* are census returns; figures in roman are estimates of the Department of Agri-
re. Estimates of numbers are obtained by applying estimated percentages of increase or decrease to
iblished numbers of the preceding year, except that a revised base is used for applying percentage
ates whenever new census data are available. It should also be observed that the census of 1910,
; numbers as of Apr. 15, is not strictly comparable with former censuses, which related to numbers
1.**

'ear.	Number.	Price per head Jan. 1.	Farm value Jan. 1.	Year.	Number.	Price per head Jan. 1.	Farm value Jan. 1.
....	39,385,000	$2.50	$98,644,000	1892..........	44,938,000	$2.58	$116,121,000
....	38,992,000	1.82	71,053,000	1893..........	47,274,000	2.66	125,909,000
....	37,724,000	1.64	62,037,000	1894..........	45,048,000	1.98	89,186,000
....	40,853,000	1.96	79,876,000	1895..........	42,294,000	1.58	66,686,000
census,				1896..........	38,299,000	1.70	65,168,000
ue 1.....	*28,477,951*	....	....				
....	31,851,000	2.14	68,310,000	1897..........	36,819,000	1.82	67,021,000
				1898..........	37,657,000	2.46	92,721,000
....	31,679,000	2.61	82,768,000	1899..........	39,114,000	2.75	107,698,000
....	33,002,000	2.71	89,427,000	1900..........	41,883,000	2.93	122,666,000
....	33,938,000	2.43	82,353,000	*1900, census,*			
....	33,784,000	2.55	86,278,000	*June 1*.....	*61,503,713*	....	....
....	35,935,000	2.37	85,121,000				
				1901[1].........	59,757,000	2.98	178,072,000
....	35,804,000	2.13	76,362,000	1902..........	62,039,000	2.65	164,446,000
....	35,740,000	2.21	78,898,000	1903..........	63,965,000	2.63	168,316,000
....	38,124,000	2.07	78,965,000	1904..........	51,630,000	2.59	133,530,000
....	40,766,000	2.21	90,231,000	1905..........	45,170,000	2.82	127,332,000
census,							
ue 1.....	*35,192,074*	....	....	1906..........	50,632,000	3.54	179,056,000
				1907..........	53,240,000	3.84	204,210,000
....	43,570,000	2.39	104,071,000	1908..........	54,631,000	3.88	211,736,000
....	45,016,000	2.37	106,596,000	1909..........	56,084,000	3.43	192,632,000
....	49,237,000	2.53	124,366,000	1910..........	57,216,000	4.12	216,030,000
....	50,627,000	2.37	119,903,000	*1910, census,*			
....	50,360,000	2.14	107,961,000	*Apr. 15*....	*52,447,861*	....	....
....	48,322,000	1.91	92,444,000	1911[1].........	53,633,000	3.91	209,535,000
....	44,759,000	2.01	89,873,000	1912..........	52,362,000	3.46	181,170,000
....	43,545,000	2.05	89,280,000	1913..........	51,482,000	3.94	202,779,000
....	42,599,000	2.13	90,640,000	1914..........	49,719,000	4.04	200,803,000
....	44,336,000	2.27	100,660,000				
census,							
ue 1.....	*35,935,364*	....	....				
....	43,431,000	2.50	108,397,000				

[1] Estimates of numbers revised, based on census data.

SHEEP AND WOOL—Continued.

TABLE 148.—*Number and value of sheep on farms, by States, Jan. 1, 1913 and 1*

State.	Number (thousands) Jan. 1—		Average price per head Jan. 1—		Farm value (thousands) Jan.
	1914	1913	1914	1913	1914
Maine	177	186	$4.30	$4.20	$761
New Hampshire	39	42	4.40	4.90	172
Vermont	111	117	4.80	4.60	533
Massachusetts	31	34	5.30	4.80	164
Rhode Island	7	7	5.40	5.10	38
Connecticut	20	21	5.40	5.20	108
New York	875	875	5.40	5.00	4,725
New Jersey	31	31	5.60	5.30	174
Pennsylvania	839	865	4.90	5.00	4,111
Delaware	8	8	5.10	4.70	41
Maryland	223	225	5.00	4.60	1,115
Virginia	735	750	4.50	4.00	3,308
West Virginia	788	821	4.30	4.30	3,388
North Carolina	177	181	3.20	3.10	566
South Carolina	33	34	2.60	2.80	86
Georgia	166	169	2.10	1.90	349
Florida	118	119	1.90	2.10	224
Ohio	3,263	3,435	4.30	4.10	14,031
Indiana	1,238	1,317	4.90	4.60	6,066
Illinois	984	1,036	5.00	5.10	4,920
Michigan	2,118	2,139	4.60	4.30	9,743
Wisconsin	789	822	4.70	4.50	3,708
Minnesota	570	570	4.40	4.40	2,508
Iowa	1,249	1,249	5.30	5.10	6,620
Missouri	1,568	1,650	4.20	4.20	6,586
North Dakota	278	293	4.20	3.90	1,168
South Dakota	617	593	4.00	4.10	2,468
Nebraska	374	382	4.50	4.40	1,683
Kansas	316	316	4.50	4.60	1,422
Kentucky	1,267	1,320	4.20	4.00	5,321
Tennessee	688	724	3.40	3.10	2,339
Alabama	124	132	2.40	2.10	298
Mississippi	202	208	2.30	2.20	465
Louisiana	180	171	2.20	2.00	396
Texas	2,052	2,073	2.90	2.90	5,951
Oklahoma	75	71	4.00	3.60	300
Arkansas	124	130	2.60	2.40	322
Montana	4,293	5,111	3.70	3.70	15,884
Wyoming	4,472	4,472	4.10	4.10	18,335
Colorado	1,668	1,737	3.70	3.60	6,172
New Mexico	3,036	3,300	3.00	3.10	9,108
Arizona	1,601	1,570	3.60	3.70	5,764
Utah	1,970	1,990	3.90	4.10	7,683
Nevada	1,517	1,487	4.50	4.00	6,826
Idaho	2,981	2,951	4.20	4.00	12,520
Washington	506	501	4.40	4.20	2,226
Oregon	2,670	2,644	3.90	3.80	10,413
Cali[illegible]	2,551	2,603	3.80	3.70	9,694
	49,719	51,482	4.04	3.94	200,803

SHEEP AND WOOL—Continued.

TABLE 149.—*Imports, exports, and average prices of sheep, 1892–1913.*

Year ending June 30—	Imports.			Exports.		
	Number.	Value.	Average import price.	Number.	Value.	Average export price.
1892	380,814	$1,440,530	$3.78	46,960	$161,105	$3.43
1893	459,484	1,682,977	3.66	37,260	126,394	3.39
1894	242,568	788,181	3.25	132,370	832,763	6.29
1895	291,461	682,618	2.34	405,748	2,630,686	6.48
1896	322,692	853,530	2.65	491,565	3,076,384	6.26
1897	405,633	1,019,668	2.51	244,120	1,531,645	6.27
1898	392,314	1,106,322	2.82	199,690	1,213,886	6.08
1899	345,911	1,200,081	3.47	143,286	853,555	5.96
1900	381,792	1,365,026	3.58	125,772	733,477	5.83
1901	331,488	1,236,277	3.73	297,925	1,933,000	6.49
1902	266,953	956,710	3.58	358,720	1,940,060	5.41
1903	301,623	1,036,934	3.44	176,961	1,067,860	6.03
1904	238,094	815,289	3.42	301,313	1,954,604	6.49
1905	186,942	704,721	3.77	268,365	1,687,321	6.29
1906	240,747	1,020,359	4.24	142,690	804,090	5.64
1907	224,798	1,120,425	4.98	135,344	750,242	5.54
1908	224,765	1,082,606	4.82	101,000	589,285	5.83
1909	102,663	502,640	4.90	67,656	365,155	5.40
1910	126,152	696,879	5.52	44,517	209,000	4.69
1911	53,455	377,625	7.06	121,491	636,272	5.24
1912	23,588	157,257	6.67	157,263	626,985	3.99
1913	15,428	90,021	5.83	187,132	605,725	3.24

TABLE 150.—*Wholesale price of sheep per 100 pounds, 1899–1913.*

Date.	Chicago.		Cincinnati.		St. Louis.		Kansas City.		Omaha.	
	Inferior to choice.		Good to extra.		Good to choice natives.		Native.		Native.	
	Low.	High.	Low.	High.	Low.	High.	Low.	High.	Low.	High.
1899	$2.50	$5.65	$3.00	$5.00	$3.00	$5.60	$2.25	$5.85	$2.75	$5.50
1900	2.00	6.50	1.25	6.00	3.40	6.25	2.75	6.50	2.00	6.10
1901	2.50	5.15	2.10	5.00	3.00	5.10	1.50	5.00	2.00	5.00
1902	1.25	6.50	2.50	5.75	3.65	6.35	2.00	6.50	2.00	6.25
1903	1.25	7.00	2.60	6.25	3.50	6.25	2.25	6.80	3.00	6.75
1904	1.50	6.00	2.75	4.60	3.75	5.65	2.00	6.00	2.25	5.90
1905	3.80	6.30	3.60	5.50	4.60	6.35	2.75	6.90	2.50	6.90
1906	3.00	7.00	3.85	5.75	5.00	6.45	2.50	6.75	2.75	6.50
1907	2.00	7.25	3.65	5.90	4.25	7.00	2.25	7.75	3.00	7.75
1908	2.00	7.00	2.75	5.50	4.10	6.90	1.50	7.15	1.25	7.40
1909	2.00	6.90	3.35	5.75	4.25	6.65	2.00	8.00	2.00	6.70
1910	2.00	9.30	3.00	7.00	3.75	8.75	2.00	9.50	2.00	8.25
1911	[1] 1.50	[1] 7.85	2.40	5.15	3.50	5.00	1.50	6.25	2.50	6.20
1912	2.00	7.50	2.85	5.50	3.75	7.00	[2] 3.30	[2] 8.00	3.00	8.00
1913.										
January	3.00	6.50	3.60	5.00	4.85	5.50	4.50	7.25	4.50	8.15
February	3.50	7.00	4.50	5.25	5.25	5.90	4.00	7.25	4.90	7.75
March	3.75	7.25	4.75	6.25	5.50	6.85	4.25	7.00	5.75	7.60
April	3.75	7.90	5.00	7.00	6.75	7.25	4.50	7.50	6.00	7.50
May	3.25	6.85	4.25	5.75	5.65	6.50	3.50	7.25	5.00	6.80
June	2.50	6.10	3.75	4.85	4.75	5.00	2.75	6.00	3.75	6.75
July	2.50	5.40	3.75	4.35	4.00	4.50	2.25	5.75	2.75	6.50
August	2.00	5.00	3.75	4.25	4.00	4.25	2.25	5.00	3.00	5.50
September	2.50	4.80	3.25	4.25	4.00	4.25	2.00	5.00	3.00	5.50
October	2.50	5.10	3.75	4.50	4.40	4.55	2.50	5.25	3.00	5.50
November	2.75	5.50	3.65	4.50	4.40	4.85	2.50	6.40	3.25	6.25
December	3.00	6.00	3.75	4.75	4.80	5.00	4.00	7.00	3.00	6.75
Year	2.00	7.90	3.25	7.00	4.00	7.25	2.00	7.50	2.75	8.15

[1] Includes yearlings and lambs. [2] Not including lambs.

SHEEP AND WOOL—Continued.

TABLE 15.—*Wool product of the United States.*

[Estimates of National Association of Wool Manufacturers.]

State and year.	Number of sheep of shearing age Apr. 1, 1913.	Average weight of fleece.	Per cent of shrinkage.	Wool washed and unwashed.[1]	Wool scoured.[1]
	Number.	*Pounds.*	*Per cent.*	*Pounds.*	*Pounds.*
Maine	150,000	6.25	42	937,500	543,750
New Hampshire	33,000	6.50	48	214,500	111,540
Vermont	85,000	6.75	50	573,750	286,875
Massachusetts	23,000	6.25	42	143,750	83,375
Rhode Island	5,000	6.00	42	30,000	17,400
Connecticut	15,000	5.70	42	85,500	49,590
New York	550,000	6.50	47	3,575,000	1,894,750
New Jersey	17,000	5.40	46	91,800	49,572
Pennsylvania	648,000	6.50	48	4,212,000	2,190,240
Delaware	5,000	5.30	44	26,500	14,840
Maryland	128,000	5.50	44	704,000	394,240
Virginia	445,000	4.50	36	2,002,500	1,281,600
West Virginia	575,000	5.50	48	3,162,500	1,644,500
North Carolina	150,000	3.75	42	562,500	326,250
South Carolina	30,000	3.60	42	108,000	62,640
Georgia	175,000	3.50	42	612,500	355,250
Florida	100,000	3.25	38	325,000	201,500
Ohio	2,300,000	6.50	50	14,950,000	7,475,000
Indiana	800,000	6.50	46	5,200,000	2,808,000
Illinois	650,000	6.50	47	4,225,000	2,239,250
Michigan	1,200,000	7.00	49	8,400,000	4,284,000
Wisconsin	640,000	6.70	45	4,288,000	2,358,400
Minnesota	440,000	6.75	48	2,970,000	1,544,400
Iowa	820,000	6.75	48	5,535,000	2,878,200
Missouri	1,050,000	6.75	45	7,087,500	3,898,125
North Dakota	240,000	7.00	62	1,680,000	638,400
South Dakota	450,000	7.00	62	3,150,000	1,197,000
Nebraska	260,000	6.70	63	1,742,000	644,540
Kansas	210,000	6.75	65	1,417,500	496,125
Kentucky	775,000	4.60	37	3,565,000	2,245,950
Tennessee	465,000	4.20	42	1,953,000	1,132,740
Alabama	115,000	3.25	38	373,750	231,725
Mississippi	150,000	3.75	39	562,500	343,125
Louisiana	140,000	3.50	38	490,000	303,800
Texas	1,350,000	6.50	66	8,775,000	2,983,500
Oklahoma	55,000	6.50	67	357,500	117,975
Arkansas	100,000	4.10	40	400,000	240,000
Montana	4,200,000	7.50	63	31,500,000	11,655,000
Wyoming	3,600,000	8.30	69	29,880,000	9,262,800
Colorado	1,075,000	6.75	67	7,256,250	2,394,563
New Mexico	2,700,000	6.50	65	17,550,000	6,142,500
Arizona	775,000	6.50	66	5,037,500	1,712,750
Utah	1,900,000	7.25	66	13,775,000	4,683,500
Nevada	800,000	7.50	69	6,000,000	1,860,000
Idaho	1,900,000	7.50	64	14,250,000	5,130,000
Washington	375,000	9.10	70	3,412,500	1,023,750
Oregon	1,950,000	8.50	69	16,575,000	5,138,250
California	1,600,000	7.00	67	11,200,000	3,696,000
United States:					
1913	36,319,000	6.95	55	296,175,300	132,022,080
1912	38,481,000	6.82	55	304,043,400	136,866,652
1911	39,761,000	6.98	60.4	318,547,900	139,896,195
1910	41,999,500	6.70	60	321,362,750	141,805,813
1909	42,293,205	6.80	60.9	328,110,749	142,223,785
1908	40,311,548	6.70	60.5	311,138,321	135,360,646
1907	38,864,931	6.60	60.6	298,294,750	130,359,118
1906	38,540,798	6.66	61.1	298,915,130	129,410,942
1905	38,621,476	6.56	61.3	295,488,438	126,527,121
1904	38,342,072	6.50	61.6	291,783,032	123,935,147
1903	39,284,000	6.25	60.8	287,450,000	124,366,405
1902	42,184,122	6.50	60	316,341,032	137,912,085
1901	41,920,900	6.33	60.6	302,502,328	128,814,[illegible]
1900	40,267,818	6.46	61.1	288,636,621	118,223,120
1899	36,905,497	6.46	60.7	272,191,330	113,[illegible],[illegible]

[1] Totals include pulled wool.

SHEEP AND WOOL—Continued.

TABLE 152.—*Range of price of wool per pound in Boston, 1899–1913.*[1]

[1] From Commercial Bulletin, Boston.

[2] From July, 1910, quotations are for Ohio half blood, unwashed, approximately 7 cents lower than Ohio No. 1.

[3] Quoted as X, washed, to June, 1905.

[4] Excluding California since July, 1910.

SHEEP AND WOOL—Continued.

TABLE 153.—*Wholesale price of wool per pound, 1899–1913.*

Date.	Boston.		Philadelphia.		St. Louis.	
	Ohio XX, washed.		Ohio XX, washed.[1]		Best tub washed.	
	Low.	High.	Low.	High.	Low.	High.
	Cts.	*Cts.*	*Cts.*	*Cts.*	*Cts.*	*Cts.*
1899	26½	38	25½	36	25½	35
1900	27	38	27	37	25	36
1901	26	28	25	28	24	29½
1902	27	32	26	33	24	32
1903	30	35	[illegible]	34	27	31
1904	32	36	31½	33½	30½	41
1905	34	37	34	36	37	42
1906	33½	36	33	35	31	40
1907	33	35	33	34	33	38
1908	30	35	30	34	22	33
1909	34	36	32	35	30	38
1910	30	36	[illegible]	35	31	37
1911	27	32	27	31	28	33
1912	28	[illegible]	25	31	27	38
1913.						
January	32	32	30	31	37	37
February	32	33	30	31	35	37
March	29	33	29	30	33	35
April	27	29	28	29	28	33
May	27	28	25	26	28	29
June	27	27	24	25	29	29
July	27	30	24	26	35	33
August	25	29	24	25	[illegible]	30
September	25	26	24	25	[illegible]	30
October	25½	26	24	25	[illegible]	29
November	25½	26	23	24	28	28
December	25½	26	22	23	28	28
Year	25	32	22	31	28	37

[1] One-fourth to three-eighths unwashed, 1912 and 1913.

WOOL.

TABLE 154.—*International trade in wool, calendar years, 1910–1912.*

[Under wool have been included washed, unwashed, scoured, and pulled wool; slipe, sheep's wool on skins (total weight of wool and skins taken), and all other animal fibers included in United States classification of wool. The following items have been considered as not within this classification: Carded, combed, and dyed wool; flocks, goatskins with hair on, mill waste, noils, and tops. See "General note," p. 578.]

EXPORTS.

[000 omitted.]

[1] Preliminary.
[2] Year preceding.
[3] Year beginning March 21.
[4] Data for year beginning March 14, 1910.

WOOL—Continued.

BLE 154.—*International trade in wool, calendar years, 1910–1912*—Continued.

IMPORTS.

¹ Year preceding. ² Preliminary.

SWINE.

LE 155.—*Number and value of swine on farms in the United States, 1867–1914.*

.—Figures in *italics* are census returns, figures in roman are estimates of the Department of Agri- Estimates of numbers are obtained by applying estimated percentages of increase or decrease ublished numbers of the preceding year, except that a revised base is used for applying percentage es whenever new census data are available. It should also be observed that the census of 1910, numbers as of Apr. 15, is not strictly comparable with former censuses, which related to numbers

1—	Number.	Price per head.	Farm value.	Jan. 1—	Number.	Price per head.	Farm value.
......	24,694,000	$4.03	$99,637,000	1891	50,625,000	$4.15	$210,194,000
......	24,317,000	3.29	79,976,000	1892	52,398,000	4.60	241,031,000
......	23,316,000	4.65	108,431,000	1893	46,095,000	6.41	295,426,000
......	26,751,000	5.80	155,108,000	1894	45,206,000	5.98	270,385,000
nsus,				1895	44,166,000	4.97	219,501,000
1	*25,134,569*	....	....				
......	29,458,000	5.61	165,312,000	1896	42,843,000	4.35	186,530,000
				1897	40,600,000	4.10	166,273,000
......	31,798,000	4.01	127,453,000	1898	39,760,000	4.39	174,351,000
......	32,632,000	3.67	119,632,000	1899	38,652,000	4.40	170,110,000
......	30,861,000	3.98	122,696,000	1900	37,079,000	5.00	185,472,000
......	28,062,000	4.80	134,581,000	*1900, census,*			
......	25,727,000	6.00	154,251,000	*June 1*	*62,868,041*	....	....
......	28,077,000	5.66	158,873,000	1901 ¹	56,982,000	6.20	363,012,000
......	32,262,000	4.85	156,577,000	1902	48,699,000	7.03	342,121,000
......	34,766,000	3.18	110,508,000	1903	46,923,000	7.78	364,974,000
......	34,034,000	4.28	145,782,000	1904	47,009,000	6.15	289,225,000
nsus,				1905	47,321,000	5.99	283,255,000
1	*47,681,700*	....	....				
......	36,248,000	4.70	170,535,000	1906	52,103,000	6.18	321,803,000
				1907	54,794,000	7.62	417,791,000
......	44,122,000	5.97	263,543,000	1908	56,084,000	6.05	339,030,000
......	43,270,000	6.75	291,951,000	1909	54,147,000	6.55	354,794,000
......	44,201,000	5.57	246,301,000	1910	47,782,000	9.17	533,309,000
......	45,143,000	5.02	226,402,000	*1910, census,*			
......	46,092,000	4.26	196,570,000	*Apr. 1*	*58,185,676*	....	....
......	44,613,000	4.48	200,043,000	1911 ¹	65,620,000	9.37	615,170,000
......	44,347,000	4.98	220,811,000	1912	65,410,000	8.00	523,328,000
......	50,302,000	5.79	291,307,000	1913	61,178,000	9.86	603,109,000
......	51,603,000	4.72	243,418,000	1914	58,933,000	10.40	612,951,000
nsus,							
1	*57,409,583*	....	....				

¹ Estimates of numbers revised, based on census data.

SWINE—Continued.

TABLE 156.—*Number and value of swine on farms, by States, Jan. 1, 1913 and* [illegible]

State.	Number (thousands) Jan. 1—		Average price per head Jan. 1—		Farm value (thousands) Jan. 1—
	1914	1913	1914	1913	1914
Maine	97	101	$15.80	$12.90	$1,533
New Hampshire	51	52	14.80	12.70	755
Vermont	106	107	14.10	12.20	1,495
Massachusetts	106	115	14.50	13.00	1,537
Rhode Island	14	14	15.20	14.50	213
Connecticut	57	58	16.30	14.00	929
New York	753	761	14.50	12.60	10,918
New Jersey	158	160	13.60	13.00	2,14[illegible]
Pennsylvania	1,130	1,130	13.80	12.50	15,594
Delaware	58	58	10.30	11.20	597
Maryland	332	335	10.50	9.80	3,486
Virginia	869	836	8.30	7.00	7,213
West Virginia	367	356	10.10	9.00	3,707
North Carolina	1,362	1,335	9.00	7.70	12,258
South Carolina	780	765	9.10	8.50	7,098
Georgia	1,945	1,888	8.20	7.10	15,949
Florida	904	878	6.00	5.90	5,424
Ohio	3,467	3,399	11.30	10.80	39,177
Indiana	3,969	3,709	10.30	9.80	40,881
Illinois	4,358	4,315	10.80	10.50	47,066
Michigan	1,313	1,313	12.30	10.80	16,150
Wisconsin	2,050	2,030	13.00	11.60	26,650
Minnesota	1,430	1,702	14.00	12.70	20,020
Iowa	6,976	8,720	12.60	12.00	87,898
Missouri	4,250	4,087	8.50	8.50	36,125
North Dakota	428	366	13.20	13.70	5,650
South Dakota	1,039	1,181	11.30	11.00	11,741
Nebraska	3,228	3,798	11.80	11.40	38,090
Kansas	2,350	2,611	10.00	10.40	23,500
Kentucky	1,507	1,638	7.70	7.10	11,604
Tennessee	1,390	1,495	8.50	7.40	11,815
Alabama	1,485	1,456	8.50	6.80	12,622
Mississippi	1,467	1,482	8.10	6.90	11,883
Louisiana	1,398	1,412	8.00	7.00	11,184
Texas	2,618	2,493	8.60	8.40	22,515
Oklahoma	1,352	1,325	8.40	8.90	11,357
Arkansas	1,498	1,529	7.40	6.70	11,085
Montana	184	153	11.90	11.90	2,190
Wyoming	51	41	12.40	11.00	632
Colorado	205	205	10.50	11.00	2,152
New Mex[illegible]	56	52	10.10	9.60	566
Arizon[illegible]	24	23	9.60	11.50	230
Utah	85	81	10.90	11.00	926
[illegible]	33	32	12.60	11.00	416
[illegible]	252	233	10.70	10.80	2,696
Washin[illegible]	284	258	12.70	11.30	3,607
Oregon	300	268	11.00	9.50	3,300
[illegible]	797	822	10.50	9.20	8,368
[illegible]	58,933	61,178	10.40	9.86	612,951

SWINE—Continued.

TABLE 157.—*Wholesale price of live hogs per 100 pounds, 1899–1913.*

Date.	Cincinnati. Packing, fair to good.		St. Louis. Mixed packers.		Chicago.		Kansas City.		Omaha.	
	Low.	High.	Low.	High.	Low.	High.	Low.	High.	Low.	High.
1899	$3.45	$4.85	$3.40	$4.85	$3.30	$5.00	$3.62½	$4.80	$3.25	$4.70
1900	4.45	5.85	4.40	5.75	3.35	5.85	4.40	5.67½	4.15	5.62
1901	5.15	7.20	4.90	7.10	3.00	7.40	5.05	7.12½	4.45	6.85
1902	5.85	8.00	5.80	8.20	4.40	8.20	6.10	8.17½	5.25	8.05
1903	4.15	7.75	4.20	7.60	3.75	7.85	4.35	7.60	4.10	7.55
1904	4.35	6.25	4.25	6.30	3.60	6.37½	4.47½	6.07½	4.20	6.05
1905	4.60	6.35	4.75	6.35	3.90	6.45	4.55	6.25	4.30	6.10
1906	5.30	6.95	5.10	6.97	4.60	7.00	5.20	6.87½	4.85	6.75
1907	4.15	7.40	4.00	7.22	3.10	7.25	4.00	7.15	3.80	7.05
1908	4.15	7.35	4.20	7.35	3.95	7.60	4.00	7.15	3.97	6.90
1909	5.75	8.80	5.75	8.65	5.20	8.75	5.25	8.50	5.25	8.50
1910	6.95	11.10	6.80	11.05	6.50	11.20	6.90	10.90	7.26	10.85
1911	5.75	8.25	5.80	8.22	5.30	8.30	5.60	8.05	5.59	8.10
1912	6.10	9.35	5.75	9.25	[1] 5.55	[1] 9.40	5.65	9.05	7.00	9.00
1913.										
January	7.35	7.90	7.20	7.55	6.85	7.80	6.95	7.57½	7.02	7.45
February	7.70	8.90	7.40	8.50	7.25	8.70	7.35	8.50	7.29	8.25
March	8.70	10.00	8.40	9.30	8.05	9.62½	8.20	9.20	8.20	8.95
April	8.60	10.00	8.85	9.50	7.90	9.70	8.20	9.25	8.19	9.05
May	8.15	8.70	8.30	8.75	7.80	8.85	8.10	8.77½	8.10	8.65
June	8.35	8.80	8.00	8.95	7.90	9.00	8.25	8.80	8.19	8.67
July	8.70	9.60	8.70	9.50	8.20	9.62½	8.65	9.25	8.55	9.15
August	8.65	9.40	8.40	9.35	7.00	9.40	7.50	8.95	7.70	8.95
September	8.60	9.35	8.30	9.40	7.10	9.65	8.00	9.10	7.60	8.75
October	8.00	8.95	7.75	8.95	7.30	9.05	7.40	8.60	7.52	8.55
November	7.60	8.20	7.25	8.20	7.15	8.30	7.25	8.00	7.44	8.75
December	7.40	8.30	7.30	8.05	7.30	8.15	7.20	7.95	7.34	7.80
Year	7.35	10.00	7.20	9.50	6.85	9.70	6.95	9.25	7.02	9.15

[1] Light to heavy.

THE FEDERAL MEAT INSPECTION.

Some of the principal facts connected with the Federal meat inspection as administered by the Bureau of Animal Industry are shown in the following tables. The figures cover the annual totals for the fiscal years 1907 to 1913, inclusive, the former being the first year of operations under the meat-inspection law now in force. The data given comprise the number of establishments at which inspection is conducted; the number of animals of each species inspected at slaughter; the number of each species condemned, both wholly and in part, and the percentage condemned of each species and of all animals; the quantity of meat products prepared or processed under Federal supervision; and the quantity and percentage of the latter condemned.

Further details of the Federal meat inspection are published each year in the Annual Report of the Chief of the Bureau of Animal Industry.

TABLE 158.—*Number of establishments and total number of animals inspected at slaughter under Federal inspection annually, 1907 to 1913.*

Fiscal year.	Establishments.	Cattle.	Calves.	Swine.	Sheep.	Goats.	All animals.
1907	708	7,621,717	1,763,574	31,815,900	9,681,876	52,149	50,935,216
1908	787	7,116,275	1,995,487	35,113,077	9,702,545	45,953	53,973,337
1909	876	7,325,337	2,046,711	35,427,931	10,802,903	69,193	55,672,075
1910	919	7,962,189	2,295,099	27,656,021	11,149,937	115,811	49,179,057
1911	936	7,781,030	2,219,908	29,916,363	13,005,502	54,145	52,976,948
1912	940	7,532,005	2,242,929	34,966,378	14,208,724	63,983	59,014,019
1913	910	7,155,816	2,098,484	32,287,538	14,724,465	56,556	56,322,859

TABLE 159.—*Condemnations of animals at slaughter under Federal inspection annually, 1907 to 1913.*

[1] This column gives the percentage of condemnations for both in whole and in part; in other words, the percentage of all carcasses found diseased whether to a small or great extent.

TABLE 160.—*Quantity of meat and meat-food products prepared, and quantity and percentage condemned, under Federal supervision annually, 1907 to 1913.*

Fi
1907
1908
1909
1910
1911
1912
1913

The principal items in the above table, in the order of magnitude, are: Cured pork, a[illegible] lard substitute, sausage, and oleo products. The list includes a large number [illegible] mpo[illegible] ant

[illegible] y separate and additional [illegible] act, reinspections of such [illegible] process of manufacture.

[illegible] ROPE.

[illegible] wholesale prices of fresh [illegible] an capitals during the [illegible] re Chicago, New York, [illegible] the various kinds of [illegible] representative high [illegible], veal, etc., quoted at one [illegible] hers. The highest market [illegible] in several instances this

class partakes of a more or less fancy character, and so would not be comparable with the others. Thus, the "prime native steers" of Chicago, the "choice spring lambs" of New York, the "Scotch" beef and mutton on the London market, the "Doppellender" calves of Berlin, and the "extra" veal, lamb, and pork of Paris are excluded.

The quotations are taken from well-known trade papers of the various countries represented, and are those published on the first Saturday of each month. The data for the European markets have been converted at the standard rates into the equivalents in United States weights and money.

BEEF.

In connection with the beef table below it may be noted that an additional class (South American chilled beef) is included with the London quotations. This is done because of the importance of Argentine beef in the world's markets and particularly in view of the fact that this beef is now a factor in United States consumption. With an established direct trade to this country the price of this beef in New York should be practically the same as the price in London.

It should also be noted that the prices for Argentine and Paris beef are for hind quarters, whereas in all other cases they are for the whole side. Hind quarters are worth about 1½ cents a pound more than fore quarters, and this allowance should be made in comparing the figures.

TABLE 161.—*Wholesale prices, per pound, of fresh carcass beef at stated home and foreign markets, 1911 to 1913, at monthly periods.*

Date.		Chicago.	New York.	London.		Berlin.	Paris.
		Good native steers.	Choice native heavy, city dressed.	English sides.	South American chilled, hind quarters.	Fat oxen.	Hind quarters.
		Cents.	*Cents.*	*Cents.*	*Cents.*	*Cents.*	*Cents.*
January	1913	14.5	13.5 -14.5	11.1-13.0	7.6- 9.1	19.0-19.6	9.7-14.9
	1912	11.5 -12.5	11.5 -12.0	12.0-13.7	8.6-10.4	17.5-19.0	9.7-14.9
	1911	10.0 -11.5	10.0 -10.5	10.6-11.7	8.1- 9.1	16.6-17.7	10.5-16.4
February	1913	13.0	13.0 -13.5	12.0-13.0	8.1- 9.6	18.6-19.4	7.9-13.2
	1912	12.0 -12.5	11.0 -11.5	11.7-12.7	9.1-10.6	18.6-19.4	8.8-14.0
	1911	10.5 -11.25	10.0 -10.5	11.1-12.0	7.3- 8.6	16.4-17.5	9.7-14.9
March	1913	12.75	13.0 -13.5	13.2-13.7	9.9-11.1	18.1-19.4	7.9-14.0
	1912	11.5 -12.5	12.0	12.2-13.2	7.6- 9.6	17.5-18.6	7.9-14.0
	1911	10.25-11.5	9.75-10.25	10.9-12.0	8.1- 9.1	16.0-17.1	10.5-16.4
April	1913	12.75-13.0	14.0 -14.5	12.7-13.7	9.1-10.6	18.1-19.0	7.9-14.6
	1912	11.5 -12.5	12.5	13.0-13.7	9.6-11.1	18.6-19.4	10.5-16.4
	1911	10.5 -11.0	9.75-10.25	11.4-12.2	8.1- 9.6	16.8-18.1	10.5-15.5
May	1913	12.75-13.0	13.5 -14.0	13.0-13.7	9.1-10.4	18.1-19.4	7.9-15.5
	1912	12.0	13.0	13.7-14.7	10.1-10.9	17.9-19.0	11.4-17.2
	1911	10.5 -11.0	9.5 -10.0	11.7-12.4	10.1-11.1	16.8-17.9	10.5-15.8
June	1913	12.75-13.0	13.0 -13.5	13.2-14.0	7.6- 9.1	17.9-19.0	10.5-16.4
	1912	12.5 -13.25	13.0 -13.5	13.2-14.2	9.6-12.2	18.6-20.1	10.5-17.2
	1911	10.1 -11.0	9.25- 9.5	10.9-11.7	6.8- 8.1	17.9-19.0	12.3-18.2
July	1913	12.5 -13.0	13.0 -13.5	12.4-13.4	10.1-11.4	19.4-20.1	10.5-16.4
	1912	13.0 -13.75	14.0 -14.5	13.2-15.2	9.1-10.6	18.6-20.1	9.7-15.8
	1911	10.0 -11.0	9.25- 9.5	10.9-12.0	7.6- 8.6	17.9-18.6	11.4-16.4
August	1913	12.25-12.75	13.5 -14.0	12.2-13.7	9.9-10.9	19.4-20.1	8.8-14.6
	1912	13.0 -14.0	14.0 -15.0	12.7-14.2	9.6-10.9	18.6-20.1	9.7-15.8
	1911	10.5 -11.5	10.0 -10.5	11.7-12.2	9.1-10.6	17.5-18.6	11.4-18.2
September	1913	12.75-13.0	13.5 -14.0	11.7-13.0	8.6-10.1	19.6-20.5	9.7-14.6
	1912	14.0 -15.0	14.5 -15.5	12.2-13.2	7.6- 9.1	19.6-20.9	9.7-14.9
	1911	11.0 -12.5	11.5 -12.0	11.7-12.7	6.6- 8.1	17.1-18.1	8.8-14.0
October	1913	12.75-13.25	13.5 -14.0	11.1-12.7	9.6-10.9	19.0-19.6	9.7-15.8
	1912	14.75-15.25	14.5 -15.5	11.1-12.2	9.6-11.7	18.6-19.4	9.7-15.5
	1911	11.5 -12.0	10.25-11.5	10.6-12.2	8.1-10.1	16.8-18.6	10.5-14.6
November	1913	12.75-13.25	13.5 -14.0	11.1-13.0	10.6-12.0	19.4-19.6	10.5-14.9
	1912	13.5 -14.0	14.0 -15.0	10.1-11.7	7.6- 9.1	18.6-19.6	8.8-14.6
	1911	11.5 -12.5	11.5 -12.5	10.1-12.2	6.6- 8.6	17.5-19.2	9.7-15.8
December	1913	12.75-13.25	13.0 -14.0	10.9-13.0	9.9-11.1	19.4-19.6	9.7-14.0
	1912	14.25-14.5	14.0 -15.0	11.1-12.7	8.9-10.1	19.4-20.5	8.8-13.7
	1911	12.0 -13.0	11.5 -12.5	11.1-12.4	8.6- 9.6	17.5-19.2	9.7-14.0

VEAL.

TABLE [illegible].—[illegible] carcass veal at stated home and foreign [illegible] monthly periods.

Date.		[illegible]	New York.	London.	Berlin.	[illegible]
		[illegible]	Good to prime, city dressed.	Best.	Choice fat calves.	[illegible]
		[illegible]	Cents.	Cents.	Cents.	[illegible]
January	1913	[illegible]	18.5	19.3-20.3	25.9-27.0	17.6-1[illegible]
	1912	[illegible]	15.5-16.0	15.2-17.2	23.3-25.3	[illegible]
	1911	[illegible]	15.5-16.0	15.2-16.2	21.6-21.3	[illegible]
February	1913	[illegible]	18.5	15.2-17.2	24.8-25.5	17.2-1[illegible]
	1912	[illegible]	14.0	15.2-17.2	24.8-25.5	[illegible]
	1911	[illegible]	17.0	15.2-16.2	21.6-23.1	[illegible]
March	1913	[illegible]	18.5	18.2-19.3	24.8-25.3	[illegible]
	1912	[illegible]	15.0	15.7-17.2	20.9-22.7	[illegible]
	1911	[illegible]	16.0	18.2-19.2	21.0-22.3	[illegible]
April	1913	[illegible]	18.0	15.2-16.2	25.3-25.9	[illegible]
	1912	[illegible]	17.0	16.2-18.2	26.3-26.6	[illegible]
	1911	[illegible]	12.0	17.2-18.2	20.6-22.7	[illegible]
May	1913	[illegible]	16.5	16.2-17.2	24.8-25.3	[illegible]
	1912	[illegible]	14.0	14.2-15.2	24.2-24.5	[illegible]
	1911	[illegible]	13.5	15.2-16.2	22.3-23.8	[illegible]
June	1913	[illegible]	17.5	18.2-19.3	22.7-23.8	[illegible]
	1912	[illegible]	15.0	15.2-16.2	23.8-24.8	[illegible]
	1911	[illegible]	13.0	14.2-15.2	21.6-22.7	[illegible]
July	1913	[illegible]	16.0	15.2-16.2	22.7-23.1	[illegible]
	1912	[illegible]	14.0	14.7-16.2	20.9-22.2	[illegible]
	1911	[illegible]	13.5	14.7-16.2	18.8-20.6	[illegible]
August	1913	[illegible]	16.0	15.2-16.2	23.8-25.3	[illegible]
	1912	[illegible]	16.0	15.2-16.2	22.2-24.2	[illegible]
	1911	12.0	14.0	15.2-16.2	17.9-20.1	[illegible]
September	1913	[illegible]	19.0-19.5	17.7-19.3	23.3-24.5	[illegible]
	1912	15.5	16.0	16.7-18.2	23.1-24.5	[illegible]
	1911	[illegible]	14.0	15.2-16.2	21.0-22.3	[illegible]
October	1913	17.0	20.0	17.2-19.3	25.3-25.5	[illegible]
	1912	[illegible]	14.0-15.0	14.2-15.2	22.7-24.2	[illegible]
	1911	14.5	13.0	14.2-16.2	21.6-23.1	[illegible]
November	1913	17.0	19.0	17.7-19.3	24.5-25.3	[illegible]
	1912	15.5	14.0-15.0	15.2-16.2	23.1-24.2	[illegible]
	1911	[illegible]	14.5	14.7-16.2	22.3-23.9	[illegible]
December	1913	17.0	19.0	16.7-18.2	27.0	[illegible]
	1912	[illegible]	14.0-15.0	17.2-18.2	24.2-25.3	[illegible]
	1911	[illegible]	15.0	13.7-15.2	22.3-23.8	[illegible]

MUTTON.

TABLE 163.—*Wholesale prices, per pound, of fresh carcass mutton at stated home and foreign markets, 1911 to 1913, at monthly periods.*

Date.		Chicago.	New York.	London.	Berlin.	Paris.
		Good sheep.	Choice sheep.	English.	Fat wethers.	First quality.
		Cents.	Cents.	Cents.	Cents.	Cents.
January	1913	9.0	10.5	13.7-15.2	16.4-17.7	19.2-21.0
	1912	9.0	8.0	10.1-12.2	14.8-16.0	18.4-19.9
	1911	9.0	8.0	11.1-12.7	15.1-16.6	17.6-19.3
February	1913	10.5	11.0	13.7-14.7	16.8-18.6	20.2-21.9
	1912	11.0	8.0	11.7-13.2	16.8-18.6	18.4-20.2
	1911	9.0	8.0	11.7-13.2	14.9-15.1	18.4-19.9
March	1913	11.5	12.5	11.7-15.7	16.8-18.6	20.2-21.6
	1912	10.0	9.5	12.7-14.2	13.4-14.7	18.4-20.2
	1911	9.0	8.0-8.5	11.7-13.2	[illegible]-15.5	19.3-21.9
April	1913	12.0	15.0	13.7-15.2	[illegible]-18.6	20.2-21.9
	1912	12.5	11.5	14.7-15.7	[illegible]-19.0	20.2-21.9
	1911	10.5	10.0	11.1-12.7	[illegible]-15.5	18.4-20.2
May	1913	13.0	14.0	13.7-15.2	[illegible]-18.6	20.2-22.6
	1912	13.0	12.5	15.2-16.2	[illegible]-17.7	18.4-19.9
	1911	10.5	9.0	11.1-12.7	[illegible]-16.4	19.3-21.1
June	1913	12.5	12.0	14.7-16.2	[illegible]-18.4	19.3-21.1
	1912	12.0	11.5	14.2-15.7	[illegible]-19.9	17.6-19.9
	1911	10.5	10.0	10.6-12.7	[illegible]-17.7	19.3-21.1

TABLE 163.—*Wholesale prices, per pound, of fresh carcass mutton at stated ho foreign markets, 1911 to 1913, at monthly periods*—Continued.

Date.	Chicago.	New York.	London.	Berlin.
	Good sheep.	Choice sheep.	English.	Fat wethers.
	Cents.	*Cents.*	*Cents.*	*Cents.*
July 1913	11.5	11.0	12.7-15.2	17.7-19.0
1912	10.0	11.5	14.2-15.7	16.4-18.6
1911	10.5	8.0-8.5	11.1-13.7	17.3-18.1
August 1913	11.0	12.0	12.7-15.2	17.7-19.0
1912	9.0	10.5	12.7-14.7	14.9-17.7
1911	10.5	9.0	12.2-14.2	14.3-15.5
September 1913	10.0	10.5	12.7-15.2	18.1-18.6
1912	9.0	8.0-9.0	12.2-13.7	15.8-19.0
1911	10.0	8.0	11.1-12.7	13.8-15.5
October 1913	9.0	11.0	12.7-14.7	17.3-19.4
1912	9.0	8.0-8.5	11.1-12.7	14.0-17.3
1911	11.0	9.0	11.1-12.7	13.0-14.7
November 1913	9.5	11.0	14.2-15.7	17.3-19.4
1912	10.5	8.0-8.5	10.6-12.7	15.8-18.1
1911	9.0	8.0	11.1-13.2	13.0-15.5
December 1913	8.5	10.5	14.2-15.7	17.3-19.4
1912	10.0	8.0-8.5	11.1-12.7	16.8-19.4
1911	9.0	7.0	10.1-12.2	14.3-18.6

LAMB.

TABLE 164.—*Wholesale prices, per pound, of fresh carcass lamb at stated home and markets, 1911 to 1913, at monthly periods.*

Date.	Chicago.	New York.	London.	Berlin.
	Round-dressed lambs.	Good lambs.	Choice native.	Fat lambs.
	Cents.	*Cents.*	*Cents.*	*Cents.*
January 1913	14.5	14.0	[1] 22.3-24.3	18.6-19.9
1912	10.5	10.5-12.5	[1] 18.2-21.3	16.0-17.7
1911	10.5	11.5-12.0	[1] 19.3-22.3	16.6-18.1
February 1913	16.5	15.0	[1] 20.3-24.3	19.0-20.7
1912	11.0	12.0	[1] 18.2-21.3	19.0-20.7
1911	10.5	10.5-11.0	[1] 19.3-22.3	16.4-18.1
March 1913	15.0	15.5	[1] 22.3-25.3	19.0-20.7
1912	11.5	12.0	[1] 19.3-24.3	15.1-17.3
1911	11.0	10.5-11.0	[1] 23.3-24.3	16.0-17.3
April 1913	15.5	16.5	17.2-24.3	19.0-20.7
1912	14.0	14.0-15.0	21.3-24.3	19.4-21.2
1911	12.0	12.5	19.3-22.3	16.0-17.3
May 1913	16.0	16.0	18.2-22.3	19.4-20.7
1912	14.5	17.0	19.3-22.3	18.1-19.9
1911	11.5	12.5	17.2-21.3	16.4-17.3
June 1913	14.5	16.0-17.0	18.2-21.3	19.9-20.7
1912	17.0	20.0	15.2-18.2	20.3-22.0
1911	14.5	15.0-17.5	17.2-21.3	18.1-19.0
July 1913	15.0	15.0	16.2-19.3	19.4-20.3
1912	16.5	15.0	15.2-18.2	19.0-21.2
1911	14.0	14.5	15.2-18.2	18.6-19.9
August 1913	15.0-16.0	14.0	15.2-16.7	20.1-20.7
1912	14.5	14.5	15.2-16.7	17.7-20.3
1911	14.0	14.0	15.2-16.7	16.4-18.1
September 1913	15.0	14.0	14.2-16.7	19.0-20.7
1912	13.0	13.0	13.7-15.7	19.4-21.6
1911	13.5	13.0	13.2-16.2	16.0-17.3
October 1913	14.0	13.0	13.7-15.2	20.3-21.2
1912	12.0	12.0-13.0	12.2-13.7	17.7-19.9
1911	11.5	12.0	13.2-14.2	15.1-17.3
November 1913	13.0	13.0	13.7-15.2	19.9-21.2
1912	12.5	12.0	12.2-13.7	18.6-20.3
1911	10.5	11.0	11.1-13.2	16.0-18.1
December 1913	13.5	14.0	[1] 22.3-25.3	20.3-21.2
1912	12.5	12.0	13.2-14.2	19.9-21.2
1911	10.0	9.5	[1] 18.2-20.3	16.8-18.6

[1] New season's.

PORK.

TABLE 165.—*Wholesale prices, per pound, of fresh carcass pork at stated home and foreign markets, 1911 to 1913, at monthly periods.*

Date.		Chicago.	New York.	London.	Berlin.	Paris.
		Dressed hogs.	Dressed hogs (medium weight).	Best (small and medium).	Choice (medium weight).	First quality.
		Cents.	*Cents.*	*Cents.*	*Cents.*	*Cents.*
January	1913..	12.0	11.25	16.2-16.7	17.9-18.1	14.6-15.8
	1912..	9.0- 9.5	8.75	11.7-12.2	12.5-13.0	14.6-15.8
	1911..	11.0-11.75	11.75	14.2-14.7	11.7-12.5	12.6-13.5
February	1913..	11.75	11.37	15.2-16.2	17.1-17.5	14.0-14.9
	1912..	9.5-10.0	8.75	11.7-12.2	17.1-17.5	15.5-16.7
	1911..	11.5-12.0	11.6	13.7-14.7	12.5-12.7	13.7-14.4
March	1913..	12.5	12.0	16.2-16.7	16.6-17.1	14.0-15.5
	1912..	9.5-10.0	9.25	12.7-13.2	13.4-13.8	15.5-16.7
	1911..	11.5-13.0	10.75	14.7-15.2	12.3-12.7	14.6-15.5
April	1913..	12.5-12.75	13.75	15.7-16.7	15.3-15.5	14.0-14.9
	1912..	10.5-11.0	10.5	13.7-14.2	16.6-16.8	15.5-16.7
	1911..	12.5-13.5	10.5	14.2-15.2	11.7-11.9	14.9-16.4
May	1913..	12.5-13.5	12.75	15.7-16.2	14.9	14.6-15.5
	1912..	11.25-11.75	10.5	13.2-13.7	15.3-15.8	15.8-17.2
	1911..	11.0 -12.0	9.1	13.7-14.2	11.7-12.1	16.7-17.6
June	1913..	12.12-13.12	12.37	15.7-16.2	14.5-14.9	15.5-16.4
	1912..	11.0 -11.75	10.5	13.2-13.7	15.8-16.2	16.7-17.6
	1911..	9.25- 9.75	9.1	12.2-13.2	12.1-12.5	16.7-17.6
July	1913..	12.5 -13.25	12.5	14.7-15.2	15.3-15.5	15.5-16.4
	1912..	10.75-11.25	10.5	12.7-13.7	15.3-15.8	16.4-17.6
	1911..	9.75-10.0	9.5	12.2-12.7	11.7-11.9	15.8-17.2
August	1913..	12.25-13.0	13.37	14.2-14.7	16.6-17.1	15.5-16.4
	1912..	11.5 -12.5	11.5	13.7-14.2	17.3-17.7	16.4-17.6
	1911..	9.75-10.75	10.25	12.7-13.2	11.7-12.1	15.8-16.7
September	1913..	13.0	12.62	16.2-16.7	16.4-16.8	14.6-15.5
	1912..	12.0 -13.0	12.75	14.7-15.7	18.1-18.6	15.8-16.7
	1911..	10.75-11.75	11.25	12.7-13.2	13.2-13.4	15.8-16.7
October	1913..	13.0	12.75	16.0-16.7	16.2-16.4	13.7-15.5
	1912..	12.75-13.5	12.5	16.7-17.2	17.9-18.1	16.4-17.6
	1911..	10.25-11.25	9.6	13.2-14.2	13.0-13.4	14.6-15.5
November	1913..	12.5	12.0	16.2-16.7	15.8-16.0	13.2-14.0
	1912..	11.75-13.75	11.25	15.2-16.2	17.9-18.4	15.5-16.4
	1911..	9.75-10.75	8.75	12.2-13.2	13.4-13.6	14.9-15.8
December	1913..	12.0 -12.5	11.25	15.2-16.2	14.7-15.1	12.3-13.2
	1912..	12.0 -12.75	11.0	15.2-16.2	18.4	14.9-15.8
	1911..	9.75-10.75	8.5	12.2-12.7	12.1-12.5	14.6-15.8

LEGAL STANDARDS FOR DAIRY PRODUCTS.

(Revised to November 1, 1913.)

In the following [illegible], prepared in the Dairy Division of the Bureau of Animal [illegible], are [illegible] [illegible]ndards for dairy products as established by law in the [illegible] [illegible]tages stated represent minimum standards [illegible] publishes these figures as [illegible] correctness of the [illegible]

TABLE 166.—*Legal standards for dairy products.*

State.	Milk.			Skim milk.	Cream.	Butter.	Whole milk cheese.	Condensed milk.		Ice cream (plain).	Ice cream (fruit and nut).
	Total solids.	Solids not fat.	Fat.	Total solids.	Fat.	Fat.	Fat.	Total solids.	Fat.	Fat.	Fat.
	Pr.ct.	*Pr.ct.*	*Pr.ct.*	*Pr.ct.*	*Pr.ct.*	*Pr.ct.*	*Pr.ct.*	*Pr.ct.*	*Pr.ct.*	*Pr.ct.*	*Pr.ct.*
Alabama[1]											
Arizona[1]											
Arkansas[2]											
California	11.5	8.5	3.0	8.8	18.0	80.0	[3] 50	([4])	([4])	12	
Colorado			3.0		[5] 16.0	80.0	[3] 50			14	12
Connecticut	11.75	8.5	3.25		16.0						
Delaware[1]											
District of Columbia	12.5	9.0	3.5	9.3	20.0	83.0					
Florida	11.75	8.5	3.25	9.25	18.0	82.5	[3] 50	[6] 28.0	[6] 7.7	12	
Georgia	11.75	8.5	3.25	9.25	18.0	82.5	[3] 50	28.0	[3] 27.66	14	12
Hawaii[7]	11.5	8.5	3.0					28.0	7.7		
Idaho	11.2	8.0	3.2	9.3	18.0	82.5	30	([4])	([4])	14	12
Illinois	11.5	8.5	3.0	9.25	18.0	82.5	[3] 50	([4])	([4])	8	
Indiana		8.5	3.25	9.25	18.0	82.5	[3] 50	28.0	[3] 27.5	8	
Iowa	12.0		3.0		16.0	[8] 80.0				12	
Kansas	11.75	8.5	3.25	9.25	[5] 18.0	80.0	[3] 50	([4])	([4])	14	12
Kentucky	12.5	8.5	3.25	9.25	18.0	82.5	[3] 50	28.0	[3] 27.66	14	12
Louisiana		8.5	3.5	8.0	18.0			([4])	([4])		
Maine	11.75	8.5	3.25		18.0						
Maryland	12.5		3.5	9.25	18.0			([4])	([4])	4	6
Massachusetts	12.15		3.35	9.3	15.0						
Michigan	12.5		3.0							12	
Minnesota	13.0	9.75	3.25		20.0		[3] 45	([4])	([4])	12	
Mississippi[1]											
Missouri	12.0	8.75	3.25	9.25	18.0	82.5	[3] 50	28.0	7.76	14	
Montana	11.75	8.5	3.25		20.0	82.5	[3] 50			14	
Nebraska			3.0		18.0					14	12
New Hampshire	12.0			8.5	18.0	80.0				[9] 14	
New Jersey	11.5		3.0		16.0						
New Mexico[1]											
New York	11.5		3.0		18.0			([10])	[3] 25.0		
Nevada	11.75	8.5	3.25	9.25	18.0	82.5	[3] 50	26.5	7.8	14	
North Carolina	11.75	8.5	3.25	9.25	18.0	82.5	[3] 50	28.0	[3] 27.5	14	12
North Dakota	12.0	9.0	3.0		15.0					14	
Ohio	12.0		3.0			[11] 80.0		([12])	[3] 25.0		
Oklahoma	12.51	9.5	3.0		18.0	81.5				14	
Oregon		9.0	3.2		20.0		30.0	([13])	([13])	12	
Pennsylvania	12.0		3.25		18.0		32.0			8	6
Porto Rico	12.0	9.0	3.0								
Rhode Island	12.0		2.5								
South Carolina[1]											
South Dakota		8.5	3.25	9.25	18.0	80.0	[3] 50	28.0	[3] 27.5	14	12
Tennessee		8.5	3.50								
Texas		8.5	3.25								
Utah	12.0	9.0	3.2	9.0	18.0	80.0	[3] 50	([4])	([4])	14	12
Vermont	[14] 12.5	9.25									
Virginia	11.75	8.5	3.25	9.25	18.0	82.5		([4])	([4])	8	
Washington	12.0	8.75	3.25	9.3	18.0		30				
West Virginia[1]											
Wisconsin		8.5	3.0	9.0	18.0	82.5	[3] 50	28.0	8.0	14	
Wyoming		8.5	3.25	9.25	18.0	82.5	[3] 50	28.0	([15])	14	12

[1] No State standards.
[2] Federal rulings adopted.
[3] Percentage of fat based on total solids.
[4] Fat, 7.8 per cent; total solids plus fat, 34.3 per cent.
[5] For buttermaking, 25 per cent fat.
[6] This standard for sweetened condensed milk: "Evaporated milk," soilds, 24 per cent; fat, 7.8 per cent.
[7] No report; 1910 standard given.
[8] By weight.
[9] Not more than 0.2 per cent "filler."
[10] Must correspond to 11.5 per cent solids in crude milk.
[11] If artifically colored.
[12] Must correspond to 12 per cent solids in crude milk.
[13] 23-24 per cent solids, 7.9 per cent fat; 24-25 per cent solids, 7.8 per cent fat; 25-26 per cent solids, 7.7 per cent fat; 26 per cent solids, 7.6 per cent fat.
[14] In May and June, soilds 12 per cent.
[15] Fat, 27.5 per cent of total solids.

AGRICULTURAL STATISTICS FROM CENSUS FOR 1910.

TABLE 167.—*Total population, total land area, farm area, improved, woodland, and other unimproved area, and their percentages by States.*

[Quantities expressed in thousands: 000 omitted.]

.BLE 168.—*Total value of all farm property, land, buildings, implements and machinery, animals, poultry and bees,* [illegible] *by States.*

[Quantities given in thousands; 000 omitted.]

TABLE 169.—*Total number of farms, average per farm of acreage, and value of property; average value of land per acre, and total value of*

TABLE 170.—*Value of farm products.*

[Estimates of Bureau of Statistics (Crop Estimates).]

Year.

E 171.—*Value of crops and animal products in the United Statesin 1909, by geographic divisions, according to the census.*

[In thousands of dollars.]

TABLE 172.—*Tonnage carried on railways in the United States, 1910–1912.*[1]

[000 omitted.]

Product.	Year ending June 30—		
	1910	1911	1912[2]
FARM PRODUCTS.			
Animal matter:	*Short tons.*	*Short tons.*	*Short tons.*
Animals, live	11,502	13,991	14,147
Packing-house products—			
Dressed meats	2,274	2,330	2,346
Hides (including leather)	1,215	1,096	1,139
Other packing-house products	1,761	2,249	2,360
Total packing-house products	5,250	5,675	5,845
Poultry (including game and fish)	698	719	768
Wool	367	375	407
Other animal matter	2,477	3,003	3,907
Total animal matter	20,294	23,763	24,974
Vegetable matter:			
Cotton	3,024	3,486	4,953
Fruit and vegetables	11,340	11,747	12,880
Grain and grain products—			
Grain	37,421	41,058	39,29
Grain products—			
Flour	8,039	8,634	8,62
Other grain products	6,005	6,490	7,06
Total grain and grain products	51,465	56,182	55,00
Hay	5,976	6,307	6,9
Sugar	2,848	2,883	3,23
Tobacco	943	934	98
Other vegetable matter	5,989	6,910	10,12
Total vegetable matter	81,585	88,449	94,01
Total farm products	101,879	112,212	118,9
OTHER FREIGHT.			
Products of mines	544,604	539,256	566,53
Products of forests	113,011	108,506	100,14
Manufactures	136,830	132,293	136,71
All other (including all freight in less than carload lots)	72,140	74,967	75,9
Grand total	968,464	967,234	998,2

[1] Compiled from reports of the Interstate Commerce Commission. Original shipments only, excludin freight received by each railway from connecting railways and other carriers.
[2] Prelimina

IMPORTS AND EXPORTS OF AGRICULTURAL PRODUCTS.[1]

TABLE 173.—*Agricultural imports of the United States during the three years ending June 30, 1913.*

Article imported.	1911		1912		1913	
	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.
ANIMAL MATTER.						
Animals, live:						
Cattle—						
For breeding purposes, number	2,441	$362,220	2,129	$305,222	1,388	$234,489
Other ... number	180,482	2,590,857	316,243	4,500,352	420,261	6,406,179
Total cattle ... do	182,923	2,953,077	318,372	4,805,574	421,649	6,640,668
Horses—						
For breeding purposes, number	6,331	2,055,418	3,849	1,579,377	5,713	1,653,713
Other ... number	3,262	636,656	2,758	343,648	4,295	472,162
Total horses ... do	9,593	2,692,074	6,607	1,923,025	10,008	2,125,875
Sheep—						
For breeding purposes, number	5,341	116,277	2,208	29,106	388	8,903
Other ... number	48,114	261,348	21,380	128,151	15,040	81,118
Total sheep ... do	53,455	377,625	23,588	157,257	15,428	90,021
All other, including fowls	...	828,188	...	694,699	...	729,227
Total live animals	...	6,850,964	...	7,580,555	...	9,585,791
Beeswax ... pounds	902,904	270,112	1,076,741	328,752	828,793	253,867
Dairy products:						
Butter ... do	1,007,826	247,961	1,025,668	237,154	1,162,253	304,090
Cheese ... do	45,568,797	7,920,244	46,542,007	8,807,249	49,387,944	9,185,184
Cream ... gallons	2,332,875	1,873,293	1,120,427	923,779	1,247,083	1,068,109
Milk	...	75,090	...	61,671	...	135,724
Total dairy products	...	10,116,588	...	10,029,853	...	10,693,107
Eggs ... dozens	1,573,394	225,744	973,053	147,173	1,367,224	205,832
Egg yolks ... pounds	433,405	30,798	43,822	4,430	228,305	36,892
Feathers and downs, crude:						
Ostrich	} ...	5,865,830	{ ...	3,806,696	...	6,252,298
Other			...	1,228,645	...	1,985,084
Fibers, animal:						
Silk—						
Cocoons ... pounds	163,867	74,261	82,456	51,073	158,342	55,589
Raw, or as reeled from the cocoon ... pounds	22,379,998	72,713,984	21,609,520	67,173,382	26,049,472	82,147,523
Waste ... do	4,122,226	2,210,020	4,892,986	2,317,217	5,893,741	2,711,605
Total silk ... do	26,666,091	74,998,265	26,584,962	69,541,672	32,101,555	84,914,717
Wool, and hair of the camel, goat, alpaca, and like animals—						
Class 1, clothing ... pounds	40,104,845	9,044,321	71,203,329	15,106,193	67,238,715	15,422,920
Class 2, combing ... do	12,456,468	3,280,683	15,557,664	3,802,034	16,886,446	4,266,327
Class 3, carpet ... do	85,086,328	10,903,001	106,639,720	14,170,115	111,168,094	15,890,576
Total wool ... do	137,647,641	23,228,005	193,400,713	33,078,342	195,293,255	35,579,823
Total animal fibers, pounds	164,313,732	98,226,270	219,985,675	102,620,014	227,394,810	120,494,540
Gelatin ... pounds	1,312,979	387,525	783,668	181,461	1,170,082	314,601
Glue ... do	8,335,178	806,208	7,534,322	776,696	6,550,197	727,850
Honey ... gallons	112,553	62,942	115,040	62,684	116,271	68,717
Packing-house products:						
Bladders, other than fish	...	38,129	...	41,954	...	96,237
Blood, dried	...	446,698	...	215,255	...	80,145
Bones, cleaned	...	(2)	...	18,512	...	40,612
Bones, hoofs, and horns	...	1,168,924	...	1,038,653	...	885,893

[1] Forest products come within the scope of the Department of Agriculture and are therefore included alphabetical order in these tables.
[2] Not stated.

TABLE 173.—*Agricultural imports of the United States during the three years ending June 30, 1913*—Continued.

Article imported.	1911		1912		1913	
	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.
ANIMAL MATTER—Continued.						
Packing-house products—Con.						
Bristles—						
Crude, unsorted..pounds..	11,562	$9,803	26,174	$14,796	19,151	$12,583
Sorted, bunched, or prepared........pounds..	3,542,913	2,970,481	3,435,801	3,032,231	3,559,433	3,491,980
Total bristles..pounds..	3,554,475	2,980,284	3,461,975	3,047,027	3,578,584	3,504,563
Grease....................	....	1,714,757	....	963,205	....	865,443
Gut.......................	....	153,779	....	132,929	....	139,120
Hair—						
Horse............pounds..	4,542,930	1,683,820	5,381,730	2,308,319	5,147,923	2,223,344
Other animal........do....	12,992,338	956,775	10,795,253	1,025,421	11,348,597	1,099,730
Hide cuttings and other glue stock....................	....	1,633,042	....	1,707,171	....	1,767,382
Hides and skins, other than furs—						
Buffalo hides—						
Dry............pounds..	3,425,307	517,859	4,906,362	732,465	16,234,751	2,790,009
Green or pickled..do....	174,079	24,533	82,313	8,789	....	....
Calfskins—						
Dry...............do....	23,522,298	7,783,890	41,992,100	14,697,085	39,974,383	15,092,017
Green or pickled..do....	36,261,052	6,411,789	63,260,389	11,833,908	54,584,752	11,202,956
Cattle hides—						
Dry...............do....	54,630,170	10,115,816	78,131,330	15,161,229	82,595,225	18,670,672
Green or pickled..do....	95,497,626	11,493,614	172,881,183	23,244,292	185,447,165	27,628,292
Goatskins—						
Dry...............do....	64,337,587	18,796,014	69,143,153	19,930,142	70,562,896	21,099,415
Green or pickled..do....	22,576,255	2,964,543	26,197,550	3,366,413	25,687,409	3,691,002
Horse and ass skins—						
Dry............pounds..	4,550,742	1,011,433	7,194,331	1,474,590	10,978,605	2,234,581
Green or pickled..do....	5,703,531	570,740	5,674,741	597,397	8,447,909	941,371
Kangaroo...........do....	(1)	(1)	(1)	(1)	1,097,038	719,188
Sheepskins[2]—						
Dry...............do....	18,787,098	3,592,800	25,644,846	4,977,912	31,132,037	6,429,936
Green or pickled..do....	36,929,941	5,416,263	34,755,463	4,858,304	40,652,682	5,965,008
Other...............do....	8,495,709	1,805,686	7,904,337	1,593,801	4,801,838	921,727
Total hides and skins, pounds..............	374,891,395	70,504,980	537,768,098	102,476,327	572,196,690	117,386,174
Meat—						
Sausages, bologna, pounds..	666,988	140,535	971,775	182,982	728,469	157,871
Other, including meat extracts.................	....	1,201,520	....	1,176,010	....	1,268,957
Total meat.............	....	1,342,055	....	1,358,992	....	1,426,828
Oleo stearin........pounds..	5,715,348	592,119	4,913,090	448,950	9,511,134	967,000
Rennets....................	....	111,609	....	102,142	....	129,557
Sausage casings....pounds..	4,394,326	2,751,327	4,923,768	2,385,715	4,569,944	2,476,082
[illegible]al packin[illegible]	....	86,078,298	....	117,270,572	....	133,088,110
[illegible]	....	208,921,279	....	244,037,531	....	283,706,689
[illegible]	29,175,133	2,938,337	23,661,078	2,225,180	29,479,119	2,621,632
[illegible]	620	54,181	1,346	157,969	187	14,720
[illegible]	138,058,341	14,552,879	145,968,945	15,931,556	140,039,172	17,389,042
[illegible]	2,912,536	708,056	2,816,901	658,844	3,470,680	787,678
[illegible]	140,970,877	15,260,935	148,785,846	16,590,400	143,509,852	18,176,720
[illegible]	875,366,797	90,567,788	885,201,247	117,826,543	863,130,757	118,963,209

[illegible] ...skins with the wool on.

TABLE 173.—*Agricultural imports of the United States during the three years endi June 30, 1913*—Continued.

[1] Not stated.

TABLE 173.—*Agricultural imports of the United States during the three years ending June 30, 1913*—Continued.

Article imported.	1911		1912		1913	
	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.
VEGETABLE MATTER—contd.						
Forest products—Continued.						
Gums—Continued.						
Shellac ....pounds..	15,494,940	$2,306,262	18,745,771	$2,296,263	21,912,015	$3,046,919
Other	....	1,862,874	....	1,943,405	....	2,359,796
Total gums	....	101,975,319	....	114,130,192	....	112,792,825
Ivory, vegetable .....pounds..	20,851,466	772,065	23,076,847	789,602	29,656,278	977,525
Naval stores:						
Tar and pitch (of wood), barrels	1,719	10,246	679	6,227	287	5,611
Turpentine, spirits of, gallons	204,321	107,978	60,913	22,805	56,856	19,667
Total naval stores	....	118,224	....	29,032	....	25,27[illegible]
Palm leaf, natural	....	23,040	....	32,641	....	17,214
Tanning materials:						
Mangrove bark...long tons..	(1)	(1)	21,779	483,920	15,187	336,136
Quebracho, extract of, pounds	92,039,253	3,030,799	71,635,043	2,320,036	78,833,466	2,005,770
Quebracho wood.long tons..	66,617	984,841	68,174	982,315	102,769	1,300,126
Sumac, ground ....pounds..	(2)	(2)	12,498,376	235,154	14,489,776	297,508
Other	....	698,673	....	268,821	....	390,056
Total tanning materials.	....	4,714,313	....	4,290,246	....	4,329,594
Wood, not elsewhere specified—						
Brier root or brierwood and ivy or laurel root...	....	321,060	....	358,111	....	313,189
Chair cane or reed	....	460,573	....	575,221	....	620,893
Cabinet woods, unsawed—						
Cedar ....M feet..	18,172	995,968	15,035	807,699	19,092	1,094,048
Mahogany ....do....	43,914	3,171,398	43,194	3,038,043	66,318	4,839,625
Other	....	842,970	....	1,107,975	....	1,441,541
Total cabinet woods...	....	5,010,336	....	4,953,717	....	7,375,214
Logs and round timber, ...M feet..	173,906	1,815,120	155,007	1,593,099	140,876	1,506,235
Lumber—						
Boards, deals, planks, and other sawed lumber ....M feet..	872,374	16,148,980	905,275	15,802,789	1,091,649	18,969,770
Laths .. ...M..	677,770	1,693,340	646,662	1,619,919	712,119	1,905,254
Shingles ...M..	642,582	1,387,743	514,657	1,205,327	560,297	1,399,751
Other	....	1,553,760	....	1,175,342	....	885,885
[illegible]	....	20,783,823	....	19,803,377	....	23,160,609
[illegible]						
Peel[illegible]	417,819	2,683,913	484,277	2,928,768	618,124	3,843,950
[illegible]	232,749	1,800,555	238,242	1,910,283	258,455	2,183,785
[illegible]	189,387	1,080,805	178,751	995,777	160,315	927,217
[illegible]ttan or	....	925,269	....	898,552	....	1,040,121
[illegible]	....	838,140	....	633,109	....	776,198
[illegible]	....	35,719,594	....	34,650,014	....	41,747,471
[illegible]						
Chemica[illegible]						
Bleache[illegible]	161,313,079	3,494,982	161,074,535	3,436,114	163,782,137	3,726,665
Unbleac[illegible] ...do....	413,480,184	6,286,615	476,680,044	7,266,271	598,574,507	9,435,942
[illegible]chanical	527,002,219	4,198,760	431,863,879	3,516,537	364,168,563	3,002,689
[illegible]	1,101,795,812	13,980,357	1,069,618,458	14,218,922	1,126,525,207	16,165,316
[illegible]	....	162,311,565	....	172,523,465	....	180,502,444

[illegible] stated.

TABLE 173.—*Agricultural imports of the United States during the three years ending June 30, 1913*—Continued.

[1] Included in "Other," grain products.

[2] Included in "Other" distilled spirits.

TABLE 173.—*Agricultural imports of the United States during the three years ending June 30, 1913*—Continued.

Article imported.	1911 Quantity.	1911 Value.	1912 Quantity.	1912 Value.	1913 Quantity.	1913 Value.
VEGETABLE MATTER—contd.						
Liquors, alcoholic—Contd.						
Wines—Continued.						
Still wines—						
Bottled..dozen quarts..	596,529	$2,326,763	577,244	$2,414,621	678,131	$2,724,471
Unbottled.....gallons..	4,812,787	2,638,039	3,864,070	2,488,740	4,427,130	2,718,045
Total still wines.......	....	4,964,802	....	4,903,361	....	5,442,516
Total wines...........	....	8,531,626	....	9,591,451	....	10,078,707
Total alcoholic liquors.	....	18,004,921	....	19,334,605	....	20,743,129
Malt, barley. (*See* Grain and grain products.)						
Malt extract, fluid and solid...	....	16,295	....	8,639	....	12,040
Malt liquors. (*See* Liquors, alcoholic.)						
Nursery stock:						
Plants, trees, shrubs, and vines—						
Fruit plants, tropical and semitropical, for propagation, etc.............	....	18,962	....	24,825	....	5,847
Bulbs, bulbous roots or corms, cultivated for their flowers or foliage....M..	(1)	1,642,274	216,159	1,723,354	288,646	1,823,307
Other....................	....	1,094,637	....	1,251,365	....	1,379,913
Total nursery stock.....	....	2,755,873	....	2,999,544	....	3,209,067
Nuts:						
Almonds—						
Shelled..........pounds..	15,522,712	2,896,573	17,231,458	3,253,495	13,078,771	3,137,104
Unshelled..........do....					2,592,187	207,554
Coconuts, unshelled.........	....	1,704,105	....	1,949,406	....	1,781,377
Coconut meat, broken, or copra—						
Not shredded, desiccated, or prepared....pounds..	37,817,051	1,536,718	61,580,670	2,810,171	34,267,811	1,531,820
Shredded, desiccated, or prepared.......pounds..	....	(2)	5,331,826	404,969	6,602,556	493,768
Cream and Brazil..bushels..	283,902	804,064	21,539,508	1,092,671	11,933,445	668,534
Filberts—						
Shelled..........pounds..	13,957,940	1,064,772	11,198,991	813,642	1,946,488	281,460
Unshelled..........do....					8,480,818	614,023
Peanuts—						
Shelled.............do....	18,834,441	765,033	12,930,563	473,065	6,801,415	312,397
Unshelled..........do			2,627,475	102,217	12,281,580	470,390
Walnuts—						
Shelled..............do	33,619,434	4,471,227	37,213,674	4,069,515	10,371,128	2,206,261
Unshelled..........do					16,291,313	1,293,720
Other	....	1,255,921	....	858,852	....	981,497
[illegible]	....	14,198,413	....	15,828,003	....	13,979,905
[illegible]	12,405,660	139,332	16,960,968	204,746	11,047,399	141,137
[illegible] or expressed						
[illegible] butter						
[illegible]	[illegible]	[illegible]	6,074,741	1,615,377	3,603,332	992,358
[illegible]	[illegible]	[illegible]	46,370,732	3,851,279	50,504,192	4,183,036
[illegible]			1,513,051	78,077	3,383,511	185,383
[illegible]			737,256	486,060	173,690	111,228
[illegible]						
Hemp[illegible]	[illegible]	[illegible]	126	150	....	(3)
Japanese[illegible]	[illegible]	[illegible]	[illegible]	588,138	1,549,728	779,400
[illegible]	[illegible]	[illegible]	[illegible]	2,383,503	5,906,606	2,733,884
Peanut[illegible]	[illegible]	[illegible]	[illegible]	582,740	1,195,653	820,763
[illegible]	[illegible]	[illegible]	[illegible]	399,539	619,266	407,074
[illegible]	[illegible]	[illegible]	[illegible],515	6,170,882	5,221,001	6,739,172

[illegible] cluded in "Other," fixed or expressed.

TABLE 173.—*Agricultural imports of the United States during the three years ending June 30, 1913*—Continued.

Article imported.	1911 Quantity.	1911 Value.	1912 Quantity.	1912 Value.	1913 Quantity.	1913 Value.
VEGETABLE MATTER—contd.						
Oils, vegetable—Continued.						
Fixed or expressed—Contd.						
Palm oil.........pounds..	57,100,406	$4,102,916	47,159,238	$3,090,090	50,228,706	$3,351,868
Palm kernel.........do....	}	(1)	25,932,855	2,073,721	23,569,031	1,868,658
Soya bean..........do....			28,021,282	1,577,131	12,340,185	635,888
Other..................	....	7,885,041	....	355,767	....	381,801
Total fixed or expressed.	....	27,132,343	....	23,242,463	....	23,190,513
Volatile or essential—						
Lemon... ......pounds..	430,458	322,727	357,171	451,588	381,093	744,658
Other..................	....	2,260,679	....	3,140,692	....	4,194,827
Total volatile or essential	....	2,583,406	....	3,592,280	....	4,939,485
Total vegetable oils.....	....	29,715,749	....	26,834,743	....	28,129,998
Opium, crude.......pounds..	629,842	2,208,445	399,837	2,437,403	508,433	2,565,965
Rice, rice meal, etc.:						
Rice—						
Cleaned ....do....	} 76,657,974	2,126,822	25,008,414	848,469	32,715,479	1,203,005
Uncleaned, including paddy............pounds..			48,478,264	1,618,379	51,779,326	1,900,081
Rice flour, rice meal, and broken rice..pounds..	132,116,821	1,998,056	116,576,653	1,968,177	137,608,742	2,813,778
Total rice, etc.....do....	208,774,795	4,124,878	190,063,331	4,435,025	222,103,547	5,916,864
Sago, tapioca, etc............	....	1,590,971	....	1,674,725	....	2,187,217
Seeds:						
Castor beans or seeds, bushels..................	745,035	947,782	957,986	1,080,535	887,747	985,598
Clover—						
Red ....pounds..	} 25,357,826	3,046,276	38,551,137	6,099,136	6,072,842	987,702
Other...............do....					15,151,715	1,508,011
Flaxseed or linseed.bushels..	10,499,227	21,379,180	6,841,806	12,995,250	5,294,296	8,127,774
Grass seed, n. e. s..pounds..	....	(2)	24,072,821	1,400,077	25,452,076	1,637,244
Sugar beet............do....	10,988,617	724,592	11,389,394	1,103,357	14,768,207	1,064,392
Other......................	....	3,660,125	....	2,962,817	....	3,114,812
Total seeds.............	....	29,757,955	....	25,641,172	....	17,425,533
Spices:						
Unground—						
Cassia, or cassia vera, pounds..................	(3)	(3)	6,795,943	514,758	6,853,915	535,974
Ginger root, not preserved, pounds..................	(3)	(3)	5,979,314	368,175	7,756,090	399,270
Pepper, black or white. pounds..................	22,065,074	1,622,311	25,802,252	2,599,479	27,562,361	2,852,665
Other..........pounds..	28,140,552	2,383,497	14,651,846	1,464,239	16,062,861	1,576,462
Total unground, pounds..................	50,205,626	4,005,808	53,229,355	4,946,651	58,235,227	5,364,371
Ground............pounds..	8,017,286	940,392	9,887,193	1,027,519	6,990,174	822,765
Total spices......do....	58,222,912	4,946,200	63,116,548	5,974,170	65,225,401	6,187,136
Spirits, distilled. (*See* Liquors, alcoholic.)						
Starch...............pounds..	7,938,730	222,470	15,841,437	478,465	16,710,498	457,784
Straw and grass....long tons..	4,287	18,659	10,172	56,702	3,553	19,079
Sugar and molasses:						
Molasses............gallons..	23,838,190	995,006	28,828,213	1,197,878	33,926,521	1,456,350

1 Included in "Other," fixed or expressed.
2 Included in "Other" seeds.
3 Included in "Other," spices unground.

TABLE 173.—*Agricultural imports of the United States during the three years ending June 30, 1913*—Continued.

Article imported.	1911		1912		1913	
	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.
VEGETABLE MATTER—contd.						
Sugar and molasses—Contd.						
Sugar—						
Raw—						
Beet...........pounds..	24,669,287	$593,037	6,504,260	$239,484	182,647,582	$4,169,523
Cane.............do....	3,909.106,213	95,889,959	4,092,129,718	114,958,470	4,554,049,872	99,293,354
Total raw.......do....	3,933,7751500	96,482,996	4,098,633,978	115,197,954	4,736,697,454	103,462,877
Refined.............do....	4,202,765	208,100	5,984,415	317,125	3,344,034	176,946
Total sugar.....do....	3,937,978,265	96,691,096	4,104,618,393	115,515,079	4,740,041,488	103,639,823
Total sugar and molasses.............	....	97,686,102	....	116,712,957	....	105,096,173
Sugar-beet pulp......pounds..	2,685,440	22,156	(1)	(1)	(1)	(1)
Tea......................do....	102,653,942	17,613,569	101,406,816	18,207,141	94,812,800	17,433,688
Tea, waste, etc., for manufacturing..............pounds..	3,736,789	94,302	5,994,547	161,532	7,053,550	211,541
Teazels.........................	....	4,401	....	16,998	....	27,155
Tobacco:						
Leaf—						
Wrapper.........pounds..	5,956,776	6,420,298	6,474,881	8,104,907	6,398,782	8,242,212
Filler and other leaf.do....	39,976,129	21,437,003	46,536,954	23,814,407	61,133,963	27,691,361
Stems..............do....	2,270,383	8,264	1,728,545	6,270	444,373	4,938
Total tobacco.....do....	48,203,288	27,865,565	54,740,380	31,925,584	67,977,118	35,938,511
Vanilla beans...........do....	1,140,650	1,953,[illegible]72	841,628	2,025,153	1,049,497	2,641,573
Vegetables:						
Fresh or dried—						
Beans............bushels..	1,037,371	1,733,697	1,004,930	1,857,220	1,048,297	1,938,105
Onions..............do....	1,514,967	1,078,201	1,436,037	1,234,316	789,458	481,756
Peas, dried..........do....	(2)	(2)	806,762	1,515,516	1,134,346	1,835,775
Potatoes............do....	218,984	235,847	13,734,695	7,168,627	327,230	303,214
Other.........................	....	2,554,889	....	1,726,145	....	1,410,354
Total fresh or dried......	....	5,602,634	....	13,501,824	....	5,969,204
Prepared or preserved—						
Mushrooms......pounds..	6,656,957	860,884	7,406,927	1,013,082	8,123,373	1,172,376
Pickles and sauces.........	....	886,304	....	1,086,851	....	1,123,108
Other.........................	....	1,944,033	....	2,943,116	....	3,094,073
Total prepared or preserved................	....	3,691,221	....	5,043,049	....	5,389,557
Total vegetables........	....	9,293,855	....	18,544,873	....	11,358,761
Vinegar..............gallons..	302,898	75,816	360,524	81,899	296,939	85,090
Wafers, unmedicated.........	....	32,173	....	29,593	....	28,491
Wax, vegetable......pounds..	4,281,596	838,405	4,665,828	1,080,200	5,652,995	1,146,077
Wines. (*See* Liquors, alcoholic.)						
Total vegetable matter, including forest products..................	....	633,595,218	....	711,943,405	....	712,096,265
Total vegetable matter, excluding forest products..................	....	471,283,653	....	539,419,940	....	531,593,821
Total agricultural imports, including fores products..................	....	842,516,497	....	955,980,936	....	995,802,954
Total agricultural imports, excluding forest products..................	....	680,204,932	....	783,457,471	....	815,300,510

[1] Not stated.

[2] Included in "Other" vegetables, fresh or dried.

TABLE 174.—*Agricultural exports (domestic) of the United States during the three years ending June 30, 1913.*

Article exported.	1911		1912		1913	
	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.
ANIMAL MATTER.						
Animals, live:						
Cattle..........number..	150,100	$13,163,920	105,506	$8,870,075	24,714	$1,177,199
Horses..........do....	25,145	3,845,253	34,828	4,764,815	28,707	3,960,102
Mules..........do....	6,585	1,070,051	4,961	732,095	4,744	733,795
Sheep..........do....	121,491	636,272	157,263	626,985	187,132	605,725
Swine..........do....	8,551	74,032	19,038	159,370	15,332	151,747
Other (including fowls)......		259,125		294,647		451,554
Total live animals......		19,048,653		15,447,987		7,080,122
Beeswax..........pounds..	101,735	31,404	109,478	32,556	116,296	33,131
Dairy products:						
Butter..........do....	4,877,797	1,059,432	6,092,235	1,468,432	3,585,600	872,804
Cheese..........do....	10,366,605	1,288,279	6,337,560	898,035	2,599,058	441,186
Milk—						
Condensed..........do....	12,180,445	936,105	20,642,738	1,651,879	16,525,918	1,432,848
Other, including cream....		(1)		244,913		474,055
Total dairy products ....pounds..		3,283,816		4,263,259		3,220,893
Eggs..........dozens..	8,558,712	1,787,019	15,405,609	3,395,952	20,409,390	4,391,653
Egg yolks..........		5,353		29,541		67,854
Feathers..........		250,906		369,693		690,612
Fibers, animal:						
Silk waste..........pounds..	119,801	30,863	71,132	16,080	37,547	9,704
Wool..........do....	(1)	(1)	(1)	(1)	77,047	22,625
Total animal fibers ....pounds..	119,801	30,863	71,132	16,080	114,594	32,329
Glue..........do....	2,307,966	242,755	3,059,952	314,909	2,544,942	276,619
Honey..........		81,649		212,652		182,252
Packing-house products:						
Beef—						
Canned..........pounds..	10,824,504	1,254,979	11,026,431	1,303,404	6,840,348	857,826
Cured or pickled....do....	40,283,749	3,501,179	38,087,907	2,832,109	25,856,919	2,489,965
Fresh..........do....	42,510,731	4,478,401	15,264,320	1,596,319	7,362,388	902,149
Oils—Oleo oil.......do....	138,696,906	13,658,762	126,467,124	13,434,018	92,849,757	10,866,253
Oleomargarine......do....	3,794,939	408,459	3,627,425	372,567	2,987,582	311,485
Tallow..........do....	29,813,154	1,933,681	39,451,419	2,388,046	30,586,300	1,910,439
Total beef........do....	265,923,983	25,235,461	233,924,679	21,926,463	166,483,294	17,338,117
Bones, hoofs, horns, and horn tips, strips and waste..........		152,167		162,009		[2]77,576
Grease, grease scraps, and all soap stock—						
Lubricating..........	}	5,177,581	{	2,193,363		2,339,015
Soap stock..........				4,486,329		4,844,342
Hair[3]..........		1,274,345		1,426,111		1,449,157
Hides and skins, other than furs—						
Calfskins........pounds..	44,594,235	4,802,637	548,242	99,592	923,922	155,499
Cattle hides........do....			17,445,209	2,289,648	17,971,809	2,589,603
Horse..........do....			(4)	(4)	5,472,832	456,879
Other..........do....			7,253,349	769,255	1,791,775	247,943
Total..........do....	44,594,235	4,802,637	25,246,800	3,158,495	26,160,338	3,449,924
Hoofs, horns, and horn tips, strips, and waste.		(5)		(5)		102,705
Lard compounds.....do....	73,754,400	7,070,967	62,522,888	5,183,689	67,456,832	5,915,759
Meat, canned, n. e. s........		1,180,123		1,298,152		1,086,463
Mutton..........pounds..	2,160,259	219,517	3,595,543	349,875	5,266,019	591,960
Oils, animal, n. e. s. gallons..	1,019,478	681,096	1,019,412	754,342	1,603,325	970,717

[1] Not stated.
[2] Bones, including manufactures of.
[3] Including manufacture of prior to 1913.
[4] Included in "Other" hides and skins other than furs.
[5] Included in "Bones, hoofs, horns, and horn tips, strips, and waste."

TABLE 174.—*Agricultural exports (domestic) of the United States during the three years ending June 30, 1913*—Continued.

Article exported.	1911		1912		1913	
	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.
ANIMAL MATTER—continued.						
Packing-house products—Con.						
Pork—						
Canned ....pounds..	4,010,862	$483,959	5,839,902	$681,127	4,148,343	$565,039
Cured—						
Bacon ....do....	156,675,310	21,211,605	208,574,208	24,907,197	200,993,584	25,647,167
Hams and shoulders. ....pounds..	157,709,316	20,708,882	204,044,491	24,983,376	159,544,687	21,641,386
Salted or pickled..do....	45,729,471	4,944,448	56,321,469	5,348,594	53,749,023	5,699,136
Total cured.....do....	360,114,097	46,864,935	468,940,168	55,239,167	414,287,294	52,987,689
Fresh...............do....	1,355,378	159,654	2,597,880	297,198	2,457,997	310,574
Lard................do....	476,107,857	52,509,217	532,255,865	52,090,441	519,025,384	58,187,336
Lard, neutral.......do....	37,866,812	4,134,294	62,317,909	6,655,009	44,777,692	5,129,899
Oils—Lard oil....gallons..	120,094	90,724	207,337	147,766	154,983	113,665
Total pork............	....	104,242,783	....	115,110,708	....	117,294,202
Sausage and sausage meats.						
Canned..........pounds..	4,716,610	601,596	8,036,591	1,045,834	1,117,400	145,440
Other...............do....					6,893,918	940,305
Sausage casings.......do....	40,013,760	5,466,661	36,496,326	5,034,714	26,203,391	3,901,428
Stearin..............do....	....	(1)	....	(1)	3,744,886	323,376
All other..................	....	1,197,732	....	1,497,993	....	1,935,860
Total packing-house products............	....	157,302,666	....	163,628,077	....	162,706,355
Poultry and game............	....	981,805	....	697,955	....	1,303,379
Silk waste. (*See* Fibers, animal.)						
Wool. (*See* Fibers, animal.)						
Total animal matter.....	....	183,046,889	....	188,408,661	....	179,985,199
VEGETABLE MATTER.						
Breadstuffs. (*See* Grain and grain products.)						
Broom corn.........long tons..	(²)	363,644	3,320	461,110	4,113	389,219
Cider.................gallons..	22,708	8,791	63,882	10,460	(²)	(²)
Cocoa, ground or prepared, and chocolate..............	....	498,694	....	514,266	....	376,336
Coffee:						
Green or raw......pounds..	34,853,601	5,107,949	40,779,693	6,864,668	50,723,958	8,679,422
Roasted or prepared..do....	1,484,290	272,532	1,468,767	306,090	1,469,043	331,370
Total coffee.......do..	36,337,891	5,380,481	42,248,460	7,170,758	52,193,001	9,010,792
Cotton:						
[illegible] bales..	21,622	2,345,567	26,872	2,460,130	11,843	1,078,274
pounds..	8,214,847		10,693,038		4,412,470	
[illegible] bales....	7,807,414	582,973,302	10,648,573	563,389,141	8,712,729	546,278,921
pounds	4,025,726,068		5,524,432,391		4,557,883,205	
[illegible]	4,033,940,915	585,318,869	5,535,125,429	565,849,271	4,562,295,675	547,357,195
[illegible]	....	136,354	....	173,402	....	133,990
[illegible]	....	24,676	....	38,238	....	101,036
[illegible]						
[illegible]	1,654,439	19,935	4,188,945	57,319	³1,663	46,499
[illegible]	....	336,600	....	404,024	....	524,063
[illegible]	....	356,535	....	461,343	....	570,562
[illegible]	....	27,317	....	45,726	....	73,0[illegible]
[illegible]	....	51,445	....	34,524	....	[illegible]

² Not stated. ³ Long tons.

Table 174.—*Agricultural exports (domestic) of the United States during the three years ending June 30, 1912*—**Continued.**

Article exported.	1911		1912		1913	
	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.
VEGETABLE MATTER—contd.						
Forest products—Continued.						
Naval stores—						
Rosin............barrels..	2,189,607	$14,067,335	2,474,460	$16,462,850	2,806,046	$17,359,145
Tar.................do.... Turpentine and pitch. ....barrels..	40,380	187,183	50,107	223,002	62,346	317,491
Turpentine, spirits of, ...gallons..	14,817,751	10,768,202	19,599,241	10,069,135	21,039,597	8,794,656
Total naval stores.....	....	25,022,720	....	26,754,987	....	26,471,292
Wood—						
Logs—						
Hickory........M feet..	(1)	4,278,249	7,974	271,722	8,293	309,896
Oak...............do....			5,039	200,072	3,139	125,818
Walnut............do....			9,816	612,067	12,711	692,665
Other.............do....			136,958	2,574,312	149,381	3,095,029
Total.........do....	(1)	4,278,249	159,787	3,658,173	173,524	4,223,408
Lumber—						
Boards, deals, and planks—						
Cypress.......M feet..	2,031,608	43,756,177	(2)	(2)	14,788	455,649
Fir...............do....			629,220	7,640,038	665,295	8,650,747
Gum...............do....			59,415	1,645,031	84,520	2,580,286
Oak...............do....			222,266	9,529,413	287,855	13,377,912
Pine—						
White........do....			(3)	(3)	49,283	1,661,396
Yellow—						
Pitch pine..do....			779,375	15,852,231	869,737	18,596,796
Short-leaf pine, M feet........			42,005	824,366	47,517	1,086,503
Other pine, M feet..........			270,918	6,580,689	228,365	5,211,158
Poplar...... M feet..			23,105	985,291	37,652	1,719,274
Redwood.......do....			(2)	(2)	51,903	1,355,340
Spruce.........do....			17,424	510,047	20,020	619,837
Other..........do....			262,952	7,493,538	193,373	6,661,021
Total.........do....	2,031,608	43,756,177	2,306,680	51,060,644	2,550,308	61,975,919
Joists and scantling, M feet..............	29,357	520,358	34,229	577,075	25,925	479,969
Shingles............M..	32,308	94,339	94,732	222,243	106,903	261,058
Shooks—						
Box.........number..	(1)	1,109,646	10,225,688	1,070,286	13,389,638	1,366,649
Other..........do....	1,019,411	1,662,032	1,161,591	1,888,467	1,710,095	3,037,943
Total shooks..do....	(1)	2,771,678	11,387,279	2,958,753	15,099,733	4,404,592
Staves and heading—						
Heading..............	....	388,369	....	318,092	....	346,258
Staves......number..	65,725,595	5,666,854	64,162,599	5,748,394	89,005,624	7,325,535
Total staves and heading..........	....	6,055,223	....	6,066,486	....	7,671,793
Other................	....	6,328,902	....	4,014,669	....	3,087,005
Total lumber.......	....	59,526,677	....	64,899,870	....	77,880,336
Railroad ties.............	(4)	(4)	(4)	(4)	5,416,713	2,616,563
Timber—						
Hewn..........M feet..	32,086	770,123	31,067	644,129	34,502	933,887
Sawed—						
Pitch pine......do....	499,547	11,476,732	287,652	5,612,768	447,420	9,516,618
Other...........do....			119,302	4,679,924	29,715	700,072
Total timber..do....	531,633	12,246,855	438,021	10,936,821	511,637	11,150,577
All other, including firewood.............	....	275,870	....	256,249	....	228,244
Total wood.........	....	76,327,651	....	79,751,113	....	96,099,128

[1] Not stated.
[2] Included in "Other," boards, deals, and planks.
[3] Included in "Other," pine, yellow.
[4] Included in "Other" lumber.

TABLE 174.—*Agricultural exports (domestic) of the United States during the three years ending June 30, 1913*—Continued.

… uding "Mill feed."

TABLE 174.—*Agricultural exports (domestic) of the United States during the three years ending June 30, 1913*—Continued.

Article exported.	1911		1912		1913	
	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.
VEGETABLE MATTER—contd.						
Grain and grain products—Continued.						
Grain products—Contd.						
Mill feed............tons..	(1)	(1)	(1)	(1)	156,142	$4,180,133
All other..................	....	$1,057,140	....	$1,333,560	....	862,735
Total grain products..	....	60,044,317	....	63,251,992	....	66,806,796
Total grain and grain products............	....	124,262,836	....	123,095,651	....	210,523,721
Hay...............long tons..	55,223	1,032,591	59,730	1,039,040	60,720	964,429
Hops...............pounds..	13,104,774	2,130,972	12,190,663	4,648,505	17,591,195	4,764,713
Lard compounds. (*See* Meat and meat products.)						
Liquors, alcoholic:						
Distilled spirits—						
Alcohol, including cologne spirits....proof gallons..	35,231	19,820	25,440	11,336	151,232	58,346
Rum...............do....	1,129,578	1,476,147	1,410,840	1,827,237	1,268,054	1,667,567
Whisky—						
Bourbon..........do....	58,459	86,714	84,381	124,946	60,252	119,429
Rye..............do....	133,450	251,453	140,122	267,688	177,341	327,950
Total whisky...do....	191,909	338,167	224,503	392,634	237,593	447,379
Other..............do....	42,246	51,357	23,797	43,123	29,271	44,867
Total distilled spirits, proof gallons........	1,398,964	1,885,491	1,684,580	2,274,330	1,686,150	2,218,159
Malt liquors—						
Bottled....dozen quarts..	689,093	990,395	754,422	1,101,169	866,684	1,301,244
Unbottled........gallons..	451,694	85,164	305,394	60,150	312,965	70,219
Total malt liquors.......	....	1,075,559	....	1,161,319	....	1,371,463
Wines.............gallons..	1,394,994	518,536	957,120	366,260	1,075,151	418,668
Total alcoholic liquors...	....	3,479,586	....	3,801,909	....	4,008,290
Malt. (*See* Grain and grain products.)						
Malt liquors. (*See* Liquors, alcoholic.)						
Malt sprouts. (*See* Grain and grain products.)						
Nursery stock..............	....	337,988	....	413,255	....	459,769
Nuts:						
Peanuts...........pounds..	5,447,185	276,651	5,920,711	305,465	7,301,381	366,016
Other......................	....	328,151	....	303,473	....	367,569
Total nuts.............	....	604,802	....	608,938	....	733,585
Oil cake and oil-cake meal:						
Corn...............pounds..	83,384,870	1,115,986	72,490,021	1,035,291	76,262,845	1,131,330
Cottonseed..........do....	804,596,955	10,153,475	1,293,690,138	17,325,858	1,128,092,367	15,225,798
Flaxseed, or linseed...do....	559,674,653	8,361,666	596,114,536	9,735,022	838,119,654	12,982,423
Other................do....	(2)	(2)	8,924,033	132,534	6,886,270	104,701
Total.............do....	1,447,656,478	19,631,127	1,971,218,728	28,228,705	2,049,361,136	29,444,25
Oils, vegetable:						
Fixed or expressed—						
Corn................do....	25,316,799	1,573,605	23,866,146	1,526,931	19,839,222	1,292,009
Cottonseed.........do....	225,520,944	17,137,369	399,470,973	24,089,223	315,232,892	20,736,972
Linseed..........gallons..	175,210	164,879	246,965	208,591	1,733,925	874,461
Other.....................	....	282,757	....	339,391	....	420,368
Total fixed or expressed.	....	19,158,610	....	26,164,136	....	23,323,810

[1] Included in "Bran, middlings, and mill feed."

[2] Not stated.

TABLE 174.—*Agricultural exports (domestic) of the United States during the three years ending June 30, 1913*—Continued.

Article exported.	1911		1912		1913	
	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.
VEGETABLE MATTER—contd.						
Oils, vegetable—Continued.						
Volatile, or essential—						
Peppermint.....pounds..	123,420	$269,034	155,740	$422,631	134,663	$395,551
Other....................	....	377,588	....	322,164	....	325,040
Total volatile, or essential	....	646,622	....	744,795	....	720,591
Total vegetable oils......	....	19,805,232	....	26,908,931	....	24,044,401
Rice, rice meal, etc.:						
Rice...............pounds..	15,575,271	623,572	26,797,535	851,402	24,801,280	765,447
Rice bran, meal, and polish, pounds..................	14,488,070	130,228	12,649,036	118,985	14,106,777	109,660
Rice hulls.................	....	36,811	....	181,229	....	194,757
Total..................	....	790,611	....	1,151,616	....	1,069,964
Roots, herbs, and barks, n. e. s.	....	563,862	....	549,877	....	424,312
Seeds:						
Cottonseed........pounds..	13,224,347	209,944	64,060,776	727,100	24,048,647	328,985
Flaxseed, or linseed, bushels..................	976	2,520	4,323	12,160	16,894	26,699
Grass and clover seed—						
Clover...........pounds..	4,359,167	577,929	1,874,682	317,772	5,407,594	941,62
Timothy...........do....	9,307,428	817,377	4,354,556	620,942	17,559,653	844,41
Other ....do....	(1)	334,169	(1)	534,578	8,226,512	895,2
Total grass and clover seed..................	(1)	1,729,475	(1)	1,473,292	31,193,759	2,681,31
All other seeds.............	....	533,127	....	686,250	....	527,83
Total seeds.............	....	2,475,066	....	2,898,802	....	3,564,[illegible]
Spices.........................	....	58,9[illegible]	....	74,023	....	[illegible]2,96
Spirits, distilled. (*See* Liquors, alcoholic.)						
Starch...............pounds..	158,239,178	3,137,552	83,644,749	1,965,401	110,897,591	2,609,71
Straw.............long tons..	922	10,679	1,030	11,559	634	5,63
Sugar, molasses, and sirup:						
Molasses...........gallons..	3,386,811	354,108	9,513,441	984,636	2,145,613	255,97
Sirup.................do....	12,001,799	1,752,118	19,146,986	2,539,055	14,309,029	1,937,64
Sugar—						
Refined.........pounds..	54,947,444	2,244,379	79,594,034	3,681,072	43,994,761	1,681,30
Total sugar, molasses, and sirup............	....	4,350,605	....	7,204,763	....	3,874,92
Tobacco:						
Leaf..... ....pounds..	351,568,138	39,159,708	375,373,131	43,146,013	414,160,356	49,202,45
[illegible] rimmings [illegible]	3,758,934	95,612	4,472,189	105,844	4,636,550	151,13
[illegible]	355,327,072	39,255,320	379,845,320	43,251,857	418,796,906	49,353,59
[illegible]						
[illegible]esh or [illegible]						
[illegible]eans [illegible]	288,638	814,663	341,268	1,011,466	400,868	1,080,06
[illegible]nion [illegible]	234,289	224,037	313,299	307,132	571,074	397,51
[illegible]	2,383,887	1,535,630	1,237,276	1,414,297	2,028,261	1,646,17
[illegible]	2,906,814	2,574,330	1,891,843	2,732,895	3,000,203	3,123,75
[illegible]						
[illegible]	....	1,061,259	....	1,822,357	....	1,819,28
[illegible]	....	(2)	....	(2)	....	837,57
[illegible]	....	1,909,502	....	1,988,866	....	1,572,92
[illegible]	....	2,970,761	....	3,811,223	....	4,229,77
[illegible]	....	5,545,091	....	6,544,118	....	7,353,53

[illegible] ...ner," prepared or preserved vegetables.

TABLE 174.—*Agricultural exports (domestic) of the United States during the three years ending June 30, 1913*—Continued.

Article exported.	1911		1912		1913	
	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.
VEGETABLE MATTER—contd.						
Vinegar..............gallons..	130,588	$21,876	185,580	$37,770	213,786	$63,836
Wines. (*See* Liquors, alcoholic.)						
Yeast....................	....	143,971	....	175,347	....	278,200
Total vegetable matter, including forest products..............	....	950,786,405	....	970,340,724	....	1,068,502,570
Total vegetable matter, excluding forest products..............	....	847,747,513	....	862,218,470	....	943,666,786
Total agricultural exports, including forest products..............	....	1,133,833,294	....	1,158,749,385	....	1,248,487,769
Total agricultural exports, excluding forest products..............	....	1,030,794,402	....	1,050,627,131	....	1,123,651,985

TABLE 175.—*Foreign trade of the United States in agricultural products, 1852–1913.*

[Compiled from reports of Foreign Commerce and Navigation of the United States. All values are gold.]

Year ending June 30—	Agricultural exports.[1]			Agricultural imports.[1]		Excess of agricultural exports (+) or of imports (−).
	Domestic.		Foreign.	Total.	Percentage of all imports.	
	Total.	Percentage of all domestic exports.				
Average:						
1852-1856..............	$164,895,146	80.9	$8,059,875	$77,847,158	29.1	+$95,107,863
1857-1861..............	215,708,845	81.1	10,173,833	121,018,143	38.2	+104,864,535
1862-1866..............	148,865,540	75.7	9,287,669	122,221,547	43.0	+ 35,931,662
1867-1871..............	250,713,058	76.9	8,538,101	179,774,000	42.3	+ 79,477,159
1872-1876..............	396,666,397	78.5	8,853,247	263,155,573	46.5	+142,364,071
1877-1881..............	591,350,518	80.4	8,631,780	266,383,702	50.4	+333,598,596
1882-1886..............	557,472,922	76.3	9,340,463	311,707,564	46.8	+255,105,821
1887-1891..............	573,286,616	74.7	6,982,328	366,950,109	43.3	+213,318,835
1892-1896..............	638,748,318	73.0	8,446,491	398,332,043	51.6	+248,862,766
1897-1901..............	827,566,147	65 9	10,961,539	376,549,697	50.2	+461,977,989
1902-1906..............	879,541,247	59.5	11,922,292	487,881,038	46.3	+403,582,501
1907-1911..............	975,398,554	53.9	12,126,228	634,570,734	45.2	+352,954,048
1901..............	951,628,331	65.2	11,293,045	391,931,051	47.6	+570,990,325
1902..............	857,113,533	63.2	10,308,306	413,744,557	45.8	+453,677,282
1903..............	878,480,557	63.1	13,505,343	456,199,325	44.5	+435,786,575
1904..............	859,160,264	59.9	12,625,026	461,434,851	46.6	+410,350,439
1905..............	826,904,777	55.4	12,316,525	553,851,214	49.6	+285,370,088
1906..............	976,047,104	56.8	10,856,259	554,175,242	45.2	+432,728,121
1907..............	1,054,405,416	56.9	11,613,519	626,836,808	43.7	+439,182,127
1908..............	1,017,396,404	55.5	10,298,514	539,690,121	45.2	+488,004,797
1909..............	903,238,122	55.1	9,584,934	638,612,692	48.7	+274,210,364
1910..............	871,158,425	50.9	14,469,627	687,509,115	44.2	+198,118,937
1911..............	1,030,794,402	51.2	14,664,548	680,204,932	44.5	+365,254,018
1912..............	1,050,627,131	48.4	12,107,656	783,457,471	47.4	+279,277,316
1913..............	1,123,021,469	46.2	15,029,444	815,300,510	45.0	+322,750,403

[1] Not including forest products.

TABLE 176.—*Exports of selected domestic agricultural products, 1852–1913.*

[Compiled from reports of Foreign Commerce and Navigation of the United States. Where figures are lacking, either there were no exports or they were not separately classified for publication. For "Beef, salted or pickled," and "Pork, salted or pickled," barrels, 1851–1865, were reduced to pounds at the rate of 200 pounds per barrel, and tierces, 1855–1865, at the rate of 300 pounds per tierce; cottonseed oil, 1910, pounds reduced to gallons at the rate of 7.5 pounds per gallon. It is assumed that 1 barrel of corn meal is the product of 4 bushels of corn, and 1 barrel of wheat flour the product of 5 bushels of wheat prior to 1880 and of 4½ bushels of wheat in 1880 and subsequently.]

Year ending June 30—	Cattle.	Cheese.	Packing-house products.				
			Beef, cured—salted or pickled.	Beef, fresh.	Beef oils—oleo oil.	Beef (mostly)—tallow.	Beef and its products—total, as far as ascertainable in pounds.[1]
	Number.	*Pounds.*	*Pounds.*	*Pounds.*	*Pounds.*	*Pounds.*	*Pounds.*
Average:							
1852–1856	1,431	6,200,385	25,980,520			7,468,910	33,449,430
1857–1861	20,294	13,906,430	26,985,880			13,214,614	40,200,494
1862–1866	6,531	42,683,073	27,662,720			43,202,724	70,865,444
1867–1871		52,880,978	26,954,656			27,577,269	54,531,925
1872–1876	45,672	87,173,752	35,826,646			78,994,360	114,821,006
1877–1881	127,045	129,670,479	40,174,643	69,601,120		96,822,695	218,709,987
1882–1886	131,605	108,790,010	47,401,470	97,327,819	30,276,133	48,745,416	225,625,631
1887–1891	244,394	86,354,842	65,613,851	136,447,554	50,482,249	91,608,126	411,797,859
1892–1896	349,032	66,905,798	64,898,780	207,372,575	102,038,519	56,976,840	507,177,430
1897–1901	415,488	46,108,704	52,242,288	305,626,184	139,373,402	86,082,497	637,268,235
1902–1906	508,103	19,244,482	59,208,292	272,148,180	156,925,317	59,892,601	622,843,230
1907–1911	253,867	9,152,083	46,187,175	144,799,735	170,530,432	66,356,232	448,024,017
1901	459,218	39,813,517	55,312,632	351,748,333	161,651,413	77,166,889	705,104,772
1902	392,884	27,203,184	48,632,727	301,824,473	138,546,088	34,065,758	596,254,520
1903	402,178	18,987,178	52,801,220	254,795,963	126,010,339	27,368,924	546,055,244
1904	593,409	23,335,172	57,584,710	299,579,671	165,183,839	76,924,174	663,147,095
1905	567,806	10,134,424	55,934,705	236,486,568	145,228,245	63,536,992	575,874,718
1906	584,239	16,562,451	81,088,098	268,054,227	209,658,075	97,567,156	732,884,572
1907	423,051	17,285,230	62,645,281	281,651,502	195,337,176	127,857,739	689,752,420
1908	349,210	8,439,031	46,958,367	201,154,105	212,541,157	91,307,507	579,303,478
1909	207,542	6,822,842	44,494,210	122,952,671	179,985,246	53,332,767	418,844,332
1910	139,430	2,846,709	36,554,266	75,729,666	126,091,675	29,379,992	286,295,874
1911	150,100	10,366,605	40,283,749	42,510,731	138,696,906	29,813,154	265,923,963
1912	105,506	6,337,559	38,087,907	15,264,320	126,467,124	39,451,419	233,924,626
1913	24,714	2,599,058	25,856,919	7,362,388	92,849,757	30,586,300	166,483,294

[1] Includes beef, canned, cured; beef, cured—other; beef, fresh; oils, oleo oil; oleomargarin; tallow.

TABLE 176.—*Exports of selected domestic agricultural products, 1852–1913*—Continued.

Year ending June 30—	Packing-house products—Continued. Pork, cured—bacon.	Pork, cured—hams.[1]	Pork cured—salted or pickled.	Pork—lard.	Pork and its products—total, as far as ascertainable in pounds.[2]	Apples, fresh.	Corn and corn meal (converted to corn).
	Pounds.	*Pounds.*	*Pounds.*	*Pounds.*	*Pounds.*	*Barrels.*	*Bushels.*
Average:							
1852–1856..	30,005,479	....	40,542,600	33,354,976	103,903,056	37,412	7,123,286
1857–1861..	30,583,297	....	34,854,400	37,965,993	103,403,690	57,045	6,557,610
1862–1866..	10,796,961	....	52,550,758	89,138,251	252,485,970	119,433	12,059,794
1867–1871..	45,790,113	....	28,879,085	53,579,373	128,248,571	....	9,924,235
1872–1876..	313,402,401	....	60,429,361	194,197,714	568,029,477	132,756	38,560,557
1877–1881..	643,633,709	....	85,968,138	331,457,591	1,075,793,475	509,735	88,190,030
1882–1886..	355,905,444	47,634,675	72,354,682	263,425,058	739,455,913	401,886	49,992,203
1887–1891..	419,935,416	60,697,365	73,984,682	381,388,854	936,247,966	522,511	54,606,273
1892–1896..	438,847,549	96,107,152	64,827,470	451,547,135	1,052,133,760	520,810	63,979,898
1897–1901..	536,287,266	200,853,226	112,788,498	652,418,143	1,528,138,779	779,980	192,531,378
1902–1906..	292,721,953	206,902,427	116,823,284	592,130,894	1,242,136,649	1,368,608	74,615,465
1907–1911..	209,005,144	189,603,211	90,809,879	519,746,378	1,028,996,659	1,225,655	56,568,030
1901.........	456,122,741	216,571,803	138,643,611	611,357,514	1,462,369,849	883,673	181,405,473
1902.........	383,150,624	227,653,232	115,896,275	556,840,222	1,337,315,909	459,719	28,028,688
1903.........	207,336,000	214,183,365	95,287,374	490,755,821	1,042,119,570	1,656,129	76,639,261
1904.........	249,665,941	194,948,864	112,224,861	561,302,643	1,146,255,441	2,018,262	58,222,061
1905.........	262,246,635	203,458,724	118,887,189	610,238,899	1,220,031,970	1,499,942	90,293,483
1906.........	361,210,563	194,267,949	141,820,720	741,516,886	1,464,960,356	1,208,989	119,893,833
1907.........	250,418,699	209,481,496	166,427,409	627,559,660	1,268,065,412	1,539,267	86,368,228
1908.........	241,189,929	221,769,634	149,505,937	603,413,770	1,237,210,760	1,049,545	55,063,860
1909.........	244,578,674	212,170,224	52,354,980	528,722,933	1,053,142,056	896,279	37,665,040
1910.........	152,163,107	146,885,385	40,031,599	362,927,671	707,110,062	922,078	38,128,498
1911.........	156,675,310	157,709,316	45,729,471	476,107,857	879,455,006	1,721,106	65,614,522
1912.........	208,574,208	204,044,491	56,321,469	532,255,865	1,071,951,724	1,456,381	41,797,291
1913.........	200,993,584	159,544,687	53,749,023	497,925,484	963,596,810	2,150,132	50,780,143

Year ending June 30—	Hops.	Oils, vegetable—cottonseed oil.	Rice and rice bran, meal, and polish.	Sugar, raw and refined.	Wheat.	Wheat flour.	Wheat and wheat flour (converted to wheat).
	Pounds.	*Gallons.*	*Pounds.*	*Pounds.*	*Bushels.*	*Barrels.*	*Bushels.*
Average:							
1852–1856..	1,162,802	....	56,514,840	7,730,322	4,715,021	2,891,562	19,172,830
1857–1861..	2,216,095	....	65,732,080	6,015,058	12,378,351	3,318,280	28,969,749
1862–1866..	4,719,330	....	2,257,860	3,007,777	22,529,735	3,530,757	40,183,518
1867–1871..	6,486,616	....	1,856,948	4,356,900	22,106,833	2,585,115	35,032,409
1872–1876..	3,446,466	547,450	391,344	20,142,169	48,957,518	3,415,871	66,036,873
1877–1881..	10,445,654	4,498,436	602,442	41,718,443	107,780,556	5,375,583	133,262,753
1882–1886..	9,584,437	3,467,905	561,406	107,129,770	82,883,913	8,620,199	121,674,809
1887–1891..	7,184,147	7,120,796	3,209,653	75,073,838	64,739,011	11,286,568	115,528,568
1892–1896..	15,146,667	15,782,647	10,277,947	13,999,349	99,913,895	15,713,279	170,623,652
1897–1901..	15,467,314	42,863,203	18,407,139	11,213,664	120,247,430	17,151,070	197,427,246
1902–1906..	11,476,272	38,605,737	45,977,670	14,807,014	70,527,077	15,444,100	140,025,529
1907–1911..	14,774,185	38,783,550	27,194,549	61,429,802	62,854,580	11,840,699	116,137,728
1901.........	14,963,676	49,356,741	25,527,846	8,874,860	132,060,667	18,650,979	215,990,073
1902.........	10,715,151	33,042,848	29,591,274	7,572,452	154,856,102	17,759,203	234,772,516
1903.........	7,794,705	35,642,994	19,750,448	10,520,156	114,181,420	19,716,484	202,905,598
1904.........	10,985,988	29,013,743	29,121,763	15,418,537	44,230,169	16,999,432	120,727,613
1905.........	14,858,612	51,535,580	113,282,760	18,348,077	4,394,402	8,826,335	44,112,910
1906.........	13,026,904	43,793,519	38,142,103	22,175,846	34,973,291	13,919,048	97,609,007
1907.........	16,809,534	41,880,304	30,174,371	21,237,603	76,569,423	15,584,667	146,700,425
1908.........	22,920,480	41,019,991	28,444,415	25,510,643	100,371,057	13,927,247	163,043,669
1909.........	10,446,884	51,087,329	20,511,429	79,946,297	66,923,244	10,521,161	114,268,468
1910.........	10,589,254	29,860,667	26,779,188	125,507,022	46,679,876	9,040,987	87,364,318
1911.........	13,104,774	30,069,459	30,063,341	54,947,444	23,729,302	10,129,435	69,311,760
1912.........	12,190,663	53,262,796	39,446,571	79,594,034	30,160,212	11,006,487	79,689,404
1913.........	17,591,195	42,031,052	38,908,057	43,994,761	91,602,974	11,006,487	141,132,166

[1] Subsequent to 1904, including shoulders.
[2] Includes lard; lard, neutral; pork, canned; pork, cured—bacon; pork, cured—hams; pork, cured—salted or pickled; pork, fresh.

TABLE 177.—*Imports of selected agricultural products, 1*

[Compiled from reports of Foreign Commerce and Navigation of the United St
lacking, either there were no imports or they were not separately classified
includes, prior to 1881, only "Silk, raw or as reeled from the cocoon"; in 1881 a
item and "Silk waste", after 1882, both these items and "Silk cocoons." From
are omitted in 1860, 1861, and in 1872 to 1881, small quantities of chocolate, the c
were given only in value. "Jute and jute butts" includes in 1858 and 1859 a
"Sisal grass, coir, etc ," and in 1865-1868 an unknown quantity of "Hemp." C
in "Hides and skins other than cattle and goat" in 1895–1897. Olive oil for table
and 1885-1906 all olive oil. Sisal grass includes in 1884–1890 "Other vegetab
includes in 1885–1888 all substitutes for hemp.]

Year ending June 30—	Cheese	Silk.	Wool.	Almonds.	Argols or wine lees.
Average	*Pounds.*	*Pounds.*	*Pounds.*	*Pounds.*	*Pounds.*
1852–1856	1, 053, 983		19, 067, 447	3, 460, 807	
1857-1861	1, 378, 147			3, 251, 091	
1862–1866				2, 482, 083	1, 354, 947
1867 1871		681, 609			2, 360, 629
1872–1876		1, 094, 948			4, 951, 473
1877–1881		1, 922, 269	62, 744, 282		12, 403, 256
1882–1886		4, 672, 846	83, 293, 800		17, 551, 967
1887-1891	8, 335, 323	6, 564, 121	117, 763, 689	5, 860, 728	21, 433, 570
1892–1896	9, 649, 752	8, 382, 892	162, 640, 491	7, 487, 676	26, 469, 990
1897-1901	12, 588, 515	10, 962, 210	163, 9'9, 079	7, 361, 198	24, 379, 847
1902–1906	22, 165, 754	17, 187, 544	193, 658, 402	10, 920, 881	27, 647, 440
1907-1911	37, 662, 812	22, 143, 461	199, 562, 649	15, 297, 414	29, 350, 692
1901	15, 329, 099	10, 405, 555	103, 583, 505	5, 140, 232	28, 596, 781
1902	17, 067, 714	14, 234, 826	166, 576, 966	9, 868, 962	29, 276, 148
1903	20, 671, 384	15, 270, 859	177, 137, 796	8, 142, 164	29, 966, 557
1904	22, 707, 108	16, 722, 709	173, 742, 834	9, 838, 852	24, 671, 730
1905	23, 095, 705	22, 357, 307	249, 135, 746	11, 745, 081	26, 281, 931
1906	27, 286, 866	17, 352, 021	201, 688, 668	16, 009, 328	26, 140, 835
1907	33, 848, 766	18, 743, 904	203, 847, 545	14, 233, 613	30, 540, 893
1908	32, 530, 830	16, 662, 132	125, 980, 524	17, 144, 968	26, 738, 834
1909	35, 548, 143	25, 187, 957	266, 409, 304	11, 020, 421	32, 115, 046
1910	40, 817, 524	23, 457, 223	263, 928, 232	18, 556, 358	28, 182, 966
1911	45, 568, 797	26, 666, 091	137, 647, 641	15, 522, 712	29, 176, 133
1912	46, 542, 007	26, 584, 962	193, 400, 713	17, 231, 458	23, 661, 078
1913	49, 387, 944	32, 101, 555	195, 293, 255	15, 670, 554	29, 479, 119

Year ending June 30—	Flax.	Hemp.	Hops.	Jute and jute butts.	Licorice root
Average.	*Long tons*	*Long tons.*	*Pounds.*	*Long tons.*	*Pounds.*
1852–1856	1, 143	1, 574		3, 244	
1857–1861		2, 652		17, 239	1, 372, 573
1862–1866				3, 213	1, 887, 892
1867–1871				14, 909	
1872–1876	4, 170	22, 711		49, 188	
[illegible]1881	4, 260	22, 458		62, 496	
[illegible]–1886	5, 678	30, 557	1, 618, 879	91, 058	
[illegible]7 1891	7, 021	36, 919	7, 771, 672	104, 987	59, 275, 373
[illegible]2–1896	6, 785	5, 409	2, 386, 240	84, 111	86, 444, 974
[illegible]07 1901	7, 008	4, 107	2, 381, 809	93, 970	87, 475, 620
[illegible]902–1906	8, 574	5, 230	5, 205, 867	101, 512	99, 543, 305
[illegible]	9, 721	6, 368	6, 769, 965	100, 420	96, 111, 469
[illegible]	6, 978	4, 057	2, 606, 708	103, 140	100, 106, 664
[illegible]	7, 772	6, 054	2, 805, 293	128, 963	109, 077, 323
[illegible]	8, 155	4, 919	6, 012, 510	79, 703	88, 690, 611
[illegible]	10, 123	5, 871	2, 758, 163	96, 735	89, 463, 162
[illegible]	8, 099	3, 947	4, 339, 379	98, 215	108, 443, 893
[illegible]	8, 729	5, 317	10, 113, 969	103, 945	102, 151, 969
[illegible]	8, 656	8, 718	6, 211, 893	104, 480	66, 115, 863
[illegible]	9, 528	6, 213	8, 493, 285	107, 533	109, 365, 720
[illegible]	9, 870	5, 208	7, 388, 574	156, 685	97, 742, 776
[illegible]	12, 761	6, 423	3, 200, 560	68, 155	82, 207, 408
[illegible]	7, 792	5, 278	8, 557, 531	65, 238	126, 136, 490
[illegible]	10, 900	5, 007	2, 991, 125	101, 001	74, 682, 226
[illegible]	12, 421	7, 663	8, 404, 144	126, 389	106, 116, 227

TABLE 177.—*Imports of selected agricultural products, 1852–1913*—Continued.

Year ending June 30—	Olive oil, for table use.	Opium, crude.	Potatoes.	Rice, and rice flour, rice meal, and broken rice.	Sisal grass.	Sugar, raw and refined.	Tea.
Average:	*Gallons.*	*Pounds.*	*Bushels.*	*Pounds.*	*Long tons.*	*Pounds.*	*Pounds.*
1852–1856	....	110,143	406,611	....	....	479,373,648	24,959,922
1857–1861	....	113,594	....	....	....	691,323,833	28,149,643
1862–1866	177,947	128,590	251,637	70,893,331	615	672,637,141	30,869,450
1867–1871	152,827	209,096	216,077	52,953,577	....	1,138,464,815	44,052,805
1872–1876	174,555	365,071	254,615	72,536,435	....	1,614,055,119	62,436,359
1877–1881	218,507	407,656	1,850,106	62,614,706	....	1,760,508,290	67,583,083
1882–1886	....	391,946	2,834,736	99,870,675	....	2,458,490,409	74,781,418
1887–1891	758,352	475,299	3,878,580	156,868,635	40,274	3,003,283,854	84,275,049
1892–1896	773,692	528,785	1,804,649	160,807,652	50,129	3,827,799,481	92,782,175
1897–1901	909,249	567,681	495,150	165,231,669	70,297	3,916,433,945	86,809,270
1902–1906	1,783,425	537,576	2,662,121	150,913,684	96,832	3,721,782,404	98,677,584
1907–1911	3,897,224	489,513	1,907,405	215,892,467	102,440	3,997,156,461	96,742,977
1901	983,059	583,208	371,911	117,199,710	70,076	3,975,005,840	89,806,453
1902	1,339,097	534,189	7,656,162	157,658,894	89,583	3,031,915,875	75,579,125
1903	1,494,132	516,570	358,505	169,656,284	87,025	4,216,108,106	108,574,905
1904	1,713,590	573,055	3,166,581	154,221,772	109,214	3,700,623,613	112,905,541
1905	1,923,174	594,680	181,199	106,483,515	100,301	3,680,932,998	102,706,599
1906	2,447,131	469,387	1,948,160	166,547,957	98,037	3,979,331,430	93,621,750
1907	3,449,517	565,252	176,917	209,603,180	99,061	4,391,839,975	86,368,490
1908	3,799,112	285,845	403,952	212,783,392	103,994	3,371,997,112	94,149,564
1909	4,129,454	517,388	8,383,966	222,900,422	91,451	4,189,421,018	114,916,520
1910	3,702,210	449,239	353,208	225,400,545	99,966	4,094,545,936	85,626,370
1911	4,405,827	629,842	218,984	208,774,795	117,727	3,937,978,265	102,653,942
1912	4,836,515	399,837	13,734,695	190,063,331	114,467	4,104,618,393	101,406,816
1913	5,221,001	508,433	327,230	222,103,547	153,869	4,740,041,488	94,812,800

Year ending June 30—	Beeswax.	Onions.	Plums and prunes.	Raisins.	Currants.	Dates.	Figs.
Average:	*Pounds.*	*Bushels.*	*Pounds.*	*Pounds.*	*Pounds.*	*Pounds.*	*Pounds.*
1882–1886	....	....	....	....	....	....	....
1887–1891	128,790	....	60,237,642	38,545,635	....	....	9,783,650
1892–1896	279,839	....	12,405,549	17,745,925	34,397,754	14,914,349	10,117,049
1897–1901	265,143	628,358	560,762	7,669,593	27,520,440	15,653,642	8,919,921
1902–1906	456,727	924,418	563,900	7,344,676	35,457,213	25,649,432	14,334,760
1907–1911	845,720	1,103,034	....	5,283,145	35,258,628	26,059,353	19,848,037
1901	213,773	774,042	745,974	3,860,836	16,049,198	20,013,681	9,933,871
1902	408,706	796,316	522,478	6,683,545	36,238,976	21,681,159	11,087,131
1903	488,576	925,599	633,819	6,715,675	33,878,209	43,814,917	16,482,142
1904	425,168	1,171,242	494,105	6,867,617	38,347,649	21,058,164	13,178,061
1905	373,569	856,366	671,604	4,041,689	31,742,919	19,257,250	13,364,107
1906	587,617	872,566	497,494	12,414,855	37,078,311	22,435,672	17,562,358
1907	917,088	1,126,114	323,377	3,967,151	38,392,779	31,270,899	24,346,173
1908	671,526	1,275,333	335,089	9,132,353	38,652,656	24,958,343	18,836,574
1909	764,937	574,530	296,123	5,794,320	32,482,111	21,869,218	15,235,513
1910	972,145	1,024,226	....	5,042,683	33,326,030	22,693,713	17,362,197
1911	902,904	1,514,967	....	2,479,220	33,439,565	29,504,592	23,459,728
1912	1,076,741	1,436,037	....	3,255,861	33,151,396	25,208,248	18,765,408
1913	1,076,741	789,458	....	2,579,705	47,003,345	18,145,341	17,003,848

Table 177.—*Imports of selected agricultural products, 1852–1913*—Continued.

Year ending June 30—	Hides and skins, other than furs.			Macaroni, vermicelli, and all similar preparations.	Lemons.	Oranges.	Walnuts.
	Cattle.	Goat.	Other than cattle and goat.				
	Pounds.	*Pounds.*	*Pounds.*	*Pounds.*	*Pounds.*	*Pounds.*	*Pounds.*
Average:							
1897-1901	....	68,052,973	91,173,311	....	....	....	....
1902-1906	126,995,011	93,674,819	115,952,418	....	153,160,863	41,104,544	....
1907-1911	178,681,537	94,329,840	143,351,321	99,724,072	153,343,434	12,089,790	30,960,6
1901	129,174,624	73,745,596	77,989,617	....	148,514,614	50,332,914	....
1902	148,627,907	88,038,516	89,457,680	....	164,075,309	52,742,476	....
1903	131,644,325	85,114,070	102,340,303	28,787,821	152,004,213	56,872,070	12,362,5
1904	85,370,168	86,338,547	103,024,752	40,224,202	171,923,221	35,893,260	23,670,7
1905	113,177,357	97,803,571	126,893,934	53,441,080	139,084,321	28,880,575	21,664,1
1906	156,155,300	111,079,391	158,045,419	77,926,029	138,717,252	31,134,341	24,917,0
1907	134,671,020	101,201,596	135,111,199	87,720,730	157,859,906	21,267,346	32,597,5
1908	98,353,249	63,640,758	120,770,918	97,233,708	178,490,003	18,397,429	28,867,1
1909	192,252,083	104,048,244	148,253,998	85,114,003	135,183,550	8,435,873	26,157,7
1910	318,003,538	115,844,758	174,770,732	113,772,801	160,214,785	4,676,118	33,641,4
1911	150,127,796	86,913,842	137,849,757	114,779,116	134,968,924	7,672,186	33,619,4
1912	251,012,513	95,340,703	191,414,882	108,231,028	145,639,396	7,628,662	37,213,6
1913	268,031,890	96,250,305	209,064,912	106,500,752	151,416,412	12,252,960	26,662,4

Table 178.—*Foreign trade of the United States in forest products, 1852–1913.*

[Compiled from reports of Foreign Commerce and Navigation of the United States. All values are gol

Year ending June 30—	Exports.		Imports.	Excess of exports (+) or of impor (−).
	Domestic.	Foreign.		
Average:				
1852-1856	$6,819,079	$694,037	$3,256,302	+$4,256,8
1857-1861	9,994,808	962,142	6,942,211	+ 4,014,7
1862-1866	7,366,103	798,076	8,511,370	− 347,1
1867-1871	11,775,297	690,748	14,812,576	− 2,346,5
1872-1876	17,906,771	959,862	19,728,458	− 861,8
1877-1881	17,579,313	552,514	22,006,227	− 3,874,4
1882-1886	24,704,992	1,417,226	34,252,753	− 8,130,5
1887-1891	26,060,720	1,442,760	39,647,287	−12,143,8
1892-1896	29,276,428	1,707,307	45,091,081	−14,107,3
1897-1901	45,960,863	3,283,274	52,326,879	− 3,082,7
1902-1906	63,584,670	3,850,221	79,885,457	−12,450,5
1907-1911	88,764,471	6,488,455	137,051,471	−41,798,5
1901	[illegible]5,369,161	[illegible]3,599,192	57,143,650	+ 1,824,7
[illegible]902	[illegible]8,028,764	[illegible],609,071	59,187,049	− 6,649,
[illegible]903	[illegible]8,734,016	[illegible]865,325	71,478,022	− 9,878,
[illegible]904	[illegible]0,085,78[illegible]	[illegible],177,352	79,619,296	− 5,356,
[illegible]	[illegible]	[illegible]790,097	92,680,555	−26,691,
[illegible]	[illegible]	[illegible],809,261	96,462,364	−14,677,
[illegible]90[illegible]	[illegible]2,948,705	[illegible],500,331	122,420,776	−23,971,
[illegible]	[illegible]0,362,0[illegible]	[illegible],570,397	97,733,092	− 2,800,
[illegible]	[illegible]	[illegible],810	123,920,126	−46,494,
[illegible]	[illegible]	[illegible]1,881	178,871,797	−84,039,
91[illegible]	[illegible]3,038,89[illegible]	[illegible],586,854	162,311,565	−51,685,
91[illegible]	[illegible]08,122,25[illegible]	[illegible],413,343	172,523,465	−57,987,
[illegible]	[illegible]	[illegible]	180,502,444	−48,234,

TABLE 179.—*Exports of selected domestic forest products, 1852-1913.*

[Compiled from reports of Foreign Commerce and Navigation of the United States. Where figures are lacking, either there were no exports or they were not separately classified for publication.]

Year ending June 30—	Lumber.			Rosin.	Spirits of turpentine.	Timber.	
	Boards, deals, and planks.[1]	Shooks, other than box.	Staves.			Hewn.	Sawed.
Average:	*M feet.*	*Number.*	*Number.*	*Barrels.*	*Gallons.*	*Cubic feet.*	*M feet.*
1852-1856	129,499	....	....	552,210	1,369,250	....	....
1857-1861	205,476	....	....	664,206	2,735,104	....	....
1862-1866	138,020	....	....	69,314	107,162	....	....
1867-1871	138,720	....	....	491,774	2,693,412	....	....
1872-1876	221,658	....	....	845,803	....	17,459,632	....
1877-1881	303,114	....	....	....	7,138,556	18,316,876	....
1882-1886	433,963	....	....	1,239,869	9,301,894	13,701,663	....
1887-1891	531,755	593,054	....	1,533,834	10,794,025	6,401,543	218,796
1891-1896	616,090	435,581	....	2,006,427	14,258,928	6,062,418	263,641
1897-1901	957,218	668,797	....	2,477,696	18,349,386	5,146,927	428,755
1902-1906	212,476	765,215	51,234,056	2,453,280	16,927,090	3,968,469	508,212
1907-1911	1,649,203	925,828	56,181,900	2,355,560	16,658,955	3,406,245	479,776
1901	1,101,815	714,651	47,363,262	2,820,815	20,240,851	4,624,698	533,920
1902	942,814	788,241	46,998,512	2,535,962	19,177,788	5,388,439	412,750
1903	1,065,771	566,205	55,879,010	2,396,498	16,378,787	3,291,498	530,659
1904	1,426,784	533,182	47,420,095	2,585,108	17,202,808	3,788,740	558,690
1905	1,283,406	872,192	48,286,285	2,310,275	15,894,813	3,856,623	486,411
1906	1,343,607	1,066,253	57,586,378	2,438,556	15,981,253	3,517,046	552,548
1907	1,623,964	803,346	51,120,171	2,560,966	15,854,676	3,278,110	600,865
1908	1,548,130	900,812	61,696,949	2,712,732	19,532,583	4,883,506	463,440
1909	1,357,822	977,376	52,583,016	2,170,177	17,502,028	2,950,528	383,309
1910	1,684,489	928,197	49,783,771	2,144,318	15,587,737	3,245,196	451,721
1911	2,031,608	1,019,411	65,725,595	2,189,607	14,817,751	2,673,887	499,547
						M feet.	
1912	2,306,680	1,161,591	64,162,599	2,474,460	19,599,241	31,067	406,954
1913	2,550,308	1,710,095	89,005,624	2,806,046	21,039,597	34,502	477,135

[1] Including "Joists and scantling," prior to 1884.

TABLE 180.—*Imports of selected forest products, 1852-1913.*

Year ending June 30—	Camphor, crude.	India rubber.	Rubber gums, total.	Lumber.		Shellac.	Wood pulp.
				Boards, deals, planks, and other sawed.	Shingles.		
Average:	*Pounds.*	*Pounds.*	*Pounds.*	*M feet.*	*M.*	*Pounds.*	*Long tons.*
1852-1856	213,720	....	....	....	....	....	....
1857-1861	360,522	....	....	....	....	....	....
1862-1866	386,731	....	....	....	....	634,276	....
1867-1871	....	....	[1] 7,389,890	....	....	....	....
1872-1876	....	....	12,631,388	564,642	88,197	....	....
1877-1881	1,515,614	....	15,610,634	417,907	55,394	....	....
1882-1886	1,958,608	....	24,480,997	577,728	87,760	....	....
1887-1891	2,273,853		33,226,520	646,745	184,050	5,086,421	37,251
1892-1896	1,491,902	38,359,547	39,671,553	661,495	....	5,848,339	42,771
1897-1901	1,858,018	47,469,136	52,974,744	566,394	....	8,839,232	46,827
1902-1906	2,139,183	57,903,641	75,908,633	727,205	772,340	11,613,967	130,764
1907-1911	2,939,167	80,129,567	121,504,098	899,659	866,565	19,046,030	319,007
1901	2,175,784	55,275,529	64,927,176	490,820	555,853	9,608,745	46,757
1902	1,831,058	50,413,481	67,790,069	665,603	707,614	9,061,789	67,416
1903	2,472,440	55,010,571	69,311,678	720,937	724,131	11,590,725	116,881
1904	2,819,673	59,015,551	74,327,584	589,232	770,373	10,933,413	144,796
1905	1,904,002	67,234,256	87,004,384	710,538	758,725	10,700,817	167,504
1906	1,668,744	[2] 57,844,345	81,109,451	949,717	900,856	15,780,090	157,224
1907	3,138,070	[2] 76,963,838	106,747,589	934,195	881,003	17,785,960	213,110
1908	2,814,299	[2] 62,233,160	85,809,625	791,288	988,081	13,361,932	237,514
1909	1,990,499	[2] 88,359,895	114,598,768	846,024	1,058,363	19,185,137	274,217
1910	3,026,648	[2] 101,044,681	154,620,629	1,054,416	762,798	29,402,182	378,322
1911	3,726,319	72,046,260	145,743,880	872,374	642,582	15,494,940	491,873
1912	2,154,646	110,210,173	175,965,538	905,275	514,657	18,745,771	477,508
1913	3,709,264	113,384,359	170,747,339	1,090,628	560,297	21,912,015	504,505

[1] Includes "Gutta-percha," only, for 1867.
[2] Includes "Guayule gum," crude.

ANIMALS IMPORTED FOR BREEDING PURPOSES FOR WHICH CERTIFICATES OF PURE BREEDING HAVE BEEN ISSUED.

The following table gives the number of animals imported for breeding purposes during the calendar years of 1911, 1912, and 1913, for which the Bureau of Animal Industry issued certificates of pure breeding. Beginning with January 1, 1911, these certificates were required by customs officials for the entry free of duty of animals imported for breeding purposes under the provisions of paragraph 492 of the tariff act of August 5, 1909. Such certificates have also been required by the customs officials for the entry free of duty of horses, dogs, and cats under the provisions of paragraph 397 of the tariff act of October 3, 1913, but as paragraph 619 of the latter act provides for the entry free of duty of all cattle, sheep, and swine, regardless of whether they are imported for breeding or other purposes, the figures for the calendar year of 1913 do not include any cattle, sheep, or swine imported since October 4, 1913.

Breed of animals.	1911	1912	1913
HORSES.			
Belgian draft	932	948	977
Clydesdale	127	90	98
French draft	4	9	....
Hackney	42	26	43
Percheron	1,661	1,972	1,482
Shetland pony	87	31	30
Shire	282	246	185
Standardbred [1]	2	3	3
Suffolk	38	25	38
Thoroughbred	5	11	27
Welsh pony and cob	122	104	107
Total	3,302	3,465	2,990
CATTLE.			
Aberdeen-Angus	....	....	4
Ayrshire	252	418	186
Dexter	30	60	....
French-Canadian [1]	3	....	....
Galloway	....	....	13
Guernsey	895	642	878
Hereford	3	5	68
Holstein-Friesian [1]	....	16	26
Jersey	647	461	643
Red Poll [1]	1	....	....
Shorthorn	48	95	206
Total	1,879	1,697	2,024
SHEEP.			
Cheviot	....	....	2
Cotswold	63	....	93
Dorset Horn	21	10	115
Hampshire Down	316	....	135
Kent or Romney Marsh	....	....	10
Leicester	3	2	[illegible]
Lincoln	9	....	2[illegible]
Oxford Down	227	1	79
Shropshire	458	42	276
Southdown	13	4	59
Total	1,110	59	806
HOGS.			
Berkshire	....	6	12
Hampshire [1]	1	4	....
Large Black	....	2	....
Poland China [1]	2	....	....
Tamworth	53	26	[illegible]
Yorkshire	3	3	1[illegible]
Total	59	41	2[illegible]
Dogs	613	711	570
Cats	28	28	2[illegible]

[1] Imported from Canada only.

INDEX.

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